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Christmas

TO-MORROW—or, if Post Office arrangements for our journal are as incompetent as usual, the day before yesterday—will be (or was) Christmas: the time of universal goodwill, when lions lie down with lambs, authors with scrutineers, advertisement agents with printers, professors with their students, and editors with, well, with anyone who can put up with them. And so far as veterinary surgeons are concerned they may greet the season not only with urbanity, but with modest self-esteem; for what a contribution they make to it year by year. They have dosed the turkeys, physic'd the fowls, injected the pigs, superintended the cattle and delivered the lambs. They have added to abundance; their researches have made the unthrifty to thrive, and the fat fatter. Sam Weller's "weal pie" (unless it really was cat as that realist believed) and Mr. Pickwick's "gigantic round of cold beef"—which he nobly abandoned when the unspeakable Jingle eloped with the spinster aunt—owed something of their sumptuousness, no doubt about it, to the local practitioners. Christmas is their day, and those foodstuffs outside their scope should have no part in it. "There's a fish, young ladies," Master Bailey said, "don't have none of him"; and child though he was, this was well said.

And as for those other creatures, those all too much indulged pets, what activity lies immediately before our colleagues in small-animal practice! Those poultry bones, that over-eating (we refer to the pets, of course) those hang-overs! We have a feline pest ourselves. We took her in; a stray; how good of us, how altogether admirable! By now, dear creature, she has regained her confidence: we see her among the wine-glasses; at the drinking she will insinuate herself between the wrist and the glass's brim, spilling the precious fluid; the turkey will be in mortal danger, and its more exotic viscera, destined to enrich the stuffing, will surely (at our wife's plea) disappear into her insatiable gullet. In how many homes will these travails bewilder! In like vein O. Henry wrote of those dogs who, of an evening, take their owners out on a lead. Never mind! At least it gives one an appetite for dinner.

But, more seriously, our thoughts at Christmas go out with especial regard to our members overseas. Some of them are working under primitive, even dangerous conditions, striving to raise the standards of husbandry and stock productivity for the benefit of backward peoples; some, in emergent nations, are facing the possible abandonment of their homes and work, with all the uncertainties and worries of starting afresh; some are even facing the perils of local insurrection and warfare. To every one of them we send heartfelt greetings and all our goodwill.

So, too, do we greet our American, Continental and Asian colleagues whose work, aspirations and successes are so congruous to our own, and of which we read in their literature with interest and admiration. THE VETERINARY RECORD is seen week by week by many hundreds of veterinarians and kindred workers outside the Register of our Royal College, and we wish these readers all good things this Christmastide.

It is our privilege, in a world where want, fear and strife abound, that our calling is one devoted entirely to the arts of peace and to the advancement in well being of all communities. To play our part as an international profession in feeding the hungry is to make a contribution to peace by removing one cause for desperation; and our research workers, in particular, could have no higher goal before them: we shall each enjoy our own Christmas the more in the knowledge that our efforts, in however small and indirect a manner, are helping less fortunate peoples towards a time when they may enjoy its abundance also.

In these days it is too easy to forget that the season now upon us is a religious festival, and from the point of view of our own specialised interest it is striking that animals have played so large a part in the symbolism of most great religions, and are referred to, on innumerable occasions, in the Bible. For us whose lives are spent among them, it is a cause for perpetual wonder, and a recollection to make us humble, that the Founder of the Christian faith chose to be born in a stable.

Congress Papers

SYMPOSIUM ON DISEASES OF THE BOVINE FOOT*

(1) The Applied Anatomy of the Bovine Foot

BY

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SUMMARY.—The bovine foot is formed by those parts of the third and fourth digits enclosed within the hooves and its anatomy is discussed, primarily as it concerns the clinician. However, to complete and elucidate the anatomical picture, certain topographical features and structures not belonging to the foot are discussed. In particular, the nerves to the fore and hind feet are described in some detail from metacarpus and metatarsus downward. The arterial pattern is similarly discussed. The hoof and the distal interphalangeal joint are described. The extensor and flexor tendons are not detailed but the part they play in the over-all applied picture is noted. The description of the skeleton is merely to name the bones and to indicate their surface features.

ANATOMY is clinically applied in all the conditions involving the bovine foot but not all anatomical structures are necessarily involved. This paper, therefore, is not intended to be an academic dissertation on the foot but a practical application of the anatomy of the structures immediately concerned in regional clinical conditions. However, the applied anatomy of the foot itself is not sufficient to give the clinician all the anatomical assistance he needs in his diagnosis and treatment of foot conditions. Certain structures from carpus and tarsus downward will, therefore, receive attention.

Firstly, the skeleton. There are 4 digits in the bovine which are numbered from medial to lateral, as second, third, fourth and fifth. The third and fourth only are functional, and their distal parts enclosed within the hooves together form the foot. They have the complete digital skeleton consisting of the first, second and third phalanges, the proximal sesamoids and the distal sesamoid or navicular bone. The skeleton within the hoof is composed of the distal part of the second phalanx, all of the third phalanx and the navicular bone.

Each first phalanx articulates with a trochlea at the distal end of the metacarpus and metatarsus, with which also articulate, posteriorly, the pair of proximal sesamoids to form the fetlock. The conformation of the part is quite distinct visually and its identification is used in ascertaining the sites for certain nerve blocks. Except for its posterior aspect, the first phalanx can be identified by palpation, and similarly that part of the second phalanx outside the hoof. The region which includes these 2 bones is the pastern. In both limbs the front of the digits is named the dorsal aspect: the back is called the volar aspect in the fore limb, and the plantar in the hind limb. Between the 2 digits is the interdigital space, and the part of each next to the space, *i.e.* nearer to the longitudinal axis of the limb, is the axial surface, while the part farther away is called the abaxial.

The non-functional second and fifth digits are situated behind the fetlock and consist of 2 small bones only, which have no articulation with the rest of the skeleton. They are the accessory digits of the bovine and are commonly referred to as the dew-claws.

The typical metacarpus or metatarsus consists of 5 bones, designated numerically 1 to 5 from medial to lateral. In the bovine animal there is a single large metacarpal and metatarsal bone formed by the fusion of numbers 3 and 4, the line of union being clearly defined, especially on the dorsal aspect. Both bones can be manually identified except at their posterior aspect. Though of no clinical significance, it may be mentioned that the metacarpus is completed by a small nodule of bone representing the second metacarpal, and the metatarsus by a similar bone representing the fifth metatarsal.

These general topographical terms and features, though seemingly commonplace, are nevertheless indispensable for identification of parts and for the naming of regional structures. They will be used frequently throughout this text.

The Distal Interphalangeal Joint (Coffin Joint)

This articulation is entirely within the hoof. Its position can be ascertained from the exterior by identifying the middle of the proximal border of the hoof which indicates the position of the extensor process of the third phalanx. This is actually the highest level of the joint and from here the line of the articulation sweeps obliquely down and back to a point approximately an inch and a half below the coronet. A well developed and close capsule surrounds the joint. It is reinforced in front by a band, elastic in nature, which starts on the first phalanx and ends on the extensor process of the third phalanx. There is a pair of collateral ligaments, the axial of which is the stronger. It ends on the third phalanx and the abaxial on the navicular bone. Both ligaments are strongly reinforced by fascial bands. To the abaxial end of the distal sesamoid is also attached the ligament of the dew-claw. Cruciate interdigital ligaments extend downward from the second phalanges of each main digit to insert on to the axial end of the opposite navicular bone. They prevent spread of the digits. The ligamentous fixation of the coffin joint is thus noted to be extensive and strong.

Symposium of papers presented at the Annual Congress of the British Veterinary Association in Glasgow on Thursday, September 1st, 1960.

Digital Tendons

On the dorsal aspect the common extensor tendon of the fore limb and the long extensor tendon of the hind divide a short distance above the fetlock. Each division runs down the front of respective digits to end on the extensor process of the third phalanx. The tendons of the proper extensors, *i.e.* extensors of the third and fourth digits, run over the more abaxial dorsal aspect of the digits and end on the second and third phalanges, each receiving from either side a reinforcing slip from the suspensory ligament. The dorsal aspect of each pastern is thus almost entirely covered by these tendons.

At the distal volar aspect of the metacarpus and metatarsus the superficial and deep flexor tendons bifurcate and each limb runs down the back of the respective digits. The superficial tendon ends on the second phalanx and the deep tendon on the third phalanx. Digital synovial sheaths surround the divisions of the deep tendon and extend from the distal third of the metacarpus, or metatarsus, to near the navicular bone. The sheaths may communicate at their proximal end.

The Hoof

There are 3 integral parts of the common integument, namely the dermis or true skin (*cutis vera*) upon which is the epidermis and below which is the hypodermis or subcutis.

The dermis, which is of mesodermal origin, is known as the corium of the skin. It is vascular and sensitive and consists of interlacing, collagenous and elastic fibres. Its superficial surface is covered by large numbers of papillae which project into the epidermis and anchor that tissue so that in surface stresses or strains it is not stripped off.

The epidermis is a stratified squamous epithelium of ectodermal origin, not vascular and, as stated in the previous paragraph, rests on and is fastened to the dermis or corium. It is composed of several layers of cells which are divisible into 2 zones, the *stratum corneum* and the *stratum germanitivum* or Malpighian layer. The *stratum corneum*, the superficial or horny layer, is dead and consists of several strata of dry scaly cells which are being continuously shed. The *stratum germanitivum* or deeper portion is formed of layers of living cells which possess the inherent property of mitosis and so produce more and more cells to compensate the constant wearing of the *stratum corneum*. Pigment cells to a varying degree are present in the epidermis.

The hypodermis is really the superficial fascia and unites the corium to the underlying deep fascia.

In the bovine foot the hoof is the epidermis and the matrices are homologous to the dermis or corium.

It is simplest perhaps to follow the cutaneous analogy in the foot from the deepest part, namely the subcutis.

This is absent where the corium overlies the bones, but at the back of the foot it is present as a large, rounded and dense mass of fibro-elastic tissue. This is the digital or bulbar cushion and by its shape forms the bulb of the foot. In front of the foot, over the extensor tendon, the subcutis is also fairly thick and may be referred to as the coronary cushion.

The corium exhibits regional modifications and is thus conveniently divided into parts. Next to that of the skin proper is the perioplic corium which is continued back over the bulb as the bulbar corium. The coronary portion of the corium semi-circumscribes the hoof head as a wide flat band. These parts all possess innumerable papillae, especially large on the bulb. The laminar corium is in the form of ridges, closely attached to the third phalanx, which curve round on to the sole. The solar corium is thin and papillated and intimately attached to the third phalanx.

The epidermis of the foot is the hoof proper, the horny part being the *stratum corneum*. The *stratum germanitivum* clothes the corium in an exceedingly intimate and strong fashion through reciprocal papillae and laminae. So close is this connexion that if the horn is stripped off or separated, the *stratum germanitivum* remains on the corium. The horny tissue is described as that of the wall, the sole and the bulb.

The horny wall is covered by the periople, which is present proximally as a band of soft tubular horn about half an inch in width but increases greatly over the bulb which it entirely covers. Over the lower part of the wall the periople tapers off and is reduced to a thin layer of flat cells which give a hard glistening surface to the wall. The periople blends with the haired skin proximal to it and arises from its *stratum germanitivum*. The skin-perioplic junction can be seen extending obliquely down and back towards the heel and on to the solar aspect of the bulb. The main portion of the wall is formed of horn tubes that run distally, parallel with the surface, cemented to each other by softer intertubular horn.

The tubes arise by the continuous division and proliferation of the cells situated on the tip and sides of the papillae of the *stratum germanitivum* which covers the coronary corium. The new cells are pushed outward and downward cornifying as they go; the oldest horn is thus that furthest away from the coronary region. The intertubular horn arises from proliferation of the cells on the parts of the *stratum germanitivum* between the papillae.

The horny sole is a narrow zone next to the edge of the wall, most of the solar aspect being formed by the horny bulb which is continuous behind with the periople. The horny sole and bulb arise from the local *stratum germanitivum*.

Nerves of the Fore Foot

The dorsal metacarpal nerve is the continuation of the cutaneous branch of the radial. It runs over the dorso-medial aspect of the metacarpal bone in company with the dorsal metacarpal vein to gain the medial border of the tendon of the extensor *digiti tertii* (medial digital extensor) halfway down the metacarpus. It then crosses the tendon, runs on that of the common extensor and divides into the axial dorsal nerves of the third and fourth digits just above the fetlock. There are anastomoses between these and the axial volar digital nerves.

At about the middle of the metacarpus the dorsal metacarpal nerve gives off a medial branch. This runs in the groove between the bone and the suspen-

sory ligament, over the inside of the fetlock and down as the abaxial dorsal nerve of the third digit

The dorsal branch of the ulnar nerve completes the innervation of the dorsal aspect. It runs laterally in the groove between the metacarpal bone and the suspensory ligament and continues into the foot as the abaxial dorsal nerve of the fourth digit. It also supplies the lateral dew-claw, *i.e.* the fifth digit.

On the volar aspect the main parent of the digital nerves is the median. It supplies all of the volar part of the third digit, the axial part of the fourth digit and contributes to the innervation of the abaxial part of the latter. It runs down the metacarpus somewhat deeply embedded in the local fascia alongside the medial border of the flexor tendons related to the superficial volar metacarpal artery. In the first part of its course it may be deep to the tendons. On reaching the distal third of the metacarpus the nerve divides in a variable manner, typically into medial and lateral branches. These eventually form 3 volar digital nerves and part of a fourth.

The medial branch continues the direction of its parent in the groove between suspensory ligament and flexor tendons. It runs over the sesamoid behind the medial digital vein to become the abaxial volar nerve of the third digit. Just above the fetlock the lateral branch is joined by the volar ramus of the ulnar nerve and then receives a branch from the medial nerve. On reaching the bifurcation of the flexor tendons it divides into the axial volar digital nerves of the third and fourth digits. Before it divides the nerve is related to the volar common digital artery and lies in fat below the strong fibrous plate associated with the dew-claws.

The volar branch of the ulnar nerve runs down laterally in the groove between the suspensory ligament and the flexor tendons. It joins, as already mentioned, the lateral ramus of the median and the abaxial volar nerve of the fourth digit is thus formed.

For anaesthesia, the dorsal metacarpal nerve is located by palpation at about the middle of the length of the metacarpus, medial to the extensor tendon. The dorsal branch of the ulnar may be reached on the lateral aspect about 2 inches above the fetlock in the groove between the suspensory ligament and the metacarpal bone. At this point the volar branch of the ulnar nerve may also be anaesthetised, the 2 nerves being respectively situated in front of, and behind, the suspensory ligament.

The axial volar aspect of the digits may be anaesthetised by a single injection in the mid-line just above the fetlock. This will reach the lateral branch of the median before it divides, or if it has divided its 2 branches are still close to each other. The two branches may also be simultaneously blocked on the mid-line just below the level of the dew-claws, *i.e.* after they have passed from below the fibrous plate of the dew-claws.

The medial branch of the median may be reached on the inside of the limb in the groove between the suspensory ligament and the flexor tendons about 2 inches above the fetlock.

Nerves of the Hind Foot

On the dorsal aspect the superficial peroneal nerve runs downward on the extensor tendons giving off medial and lateral branches at the middle of the metatarsus though the lateral branch may be given off earlier.

It is accompanied laterally by the dorsal metatarsal vein and at the bifurcation of the long extensor it gives off the axial dorsal nerves of the third and fourth digits. It then turns into the interdigital space to join the deep peroneal nerve and the common trunk so formed divides into 2 branches that run back and deep to join the axial plantar digital nerves. The deep peroneal nerve runs down in the dorsal metatarsal groove where it is accompanied by the dorsal metatarsal artery. The lateral and medial branches cross obliquely to the respective sides of the metatarsus and enter the grooves between the bone and the edge of the suspensory ligament. They continue over the sesamoids, in front of the digital vein and become the abaxial dorsal nerves of the third and fourth digits. The 2 branches also supply the dew-claws and give off other nerves that run cutaneously down the digits.

On the plantar aspect the tibial nerve divides into the lateral and medial plantar metatarsal nerves which run down along the respective sides of the flexor tendons. The lateral nerve continues into the foot as the abaxial plantar nerve of the fourth digit. The medial plantar nerve gives off a branch that runs into the foot as abaxial plantar nerve of the third digit and then divides into the axial plantar nerves of the third and fourth digits.

Anaesthesia of the hind foot can be achieved by 3 injections. Dorsally, the site is just above the middle of the length of the metatarsus. The vein is located and injections are made on either side of it to be sure to include both branches of the superficial peroneal nerve. The deep peroneal nerve may be reached by deeper penetration between the tendons or alternatively in the interdigital space at a point just below the fetlock. The plantar aspect can be anaesthetised by blocking the plantar metatarsal nerves on either side of the flexor tendons at about the middle of the metatarsus.

Arteries of the Fore Foot

The main vessel to the digits is the continuation of the ulnar artery as the superficial volar (III) metacarpal artery. It runs with the median nerve alongside the medial border of the flexor tendons, but near the distal end of the metacarpus it inclines towards the mid-line behind the tendons and forms superficial and deep volar arches. Continuing on, it becomes the volar common digital which passes through the bifurcation of the flexor tendons into the interdigital space. Immediately distal to the fetlock joint a collateral artery is given off to each main digit which may be called the artery of the first phalanx.

The bulbar arteries, one to each bulb, are given off just above the pastern joint and the common digital then divides into the proper volar digital arteries which run down respective axial aspects of each digit, giving off a collateral branch, the artery of the second phalanx, just below the pastern joint. Continuing down, each proper digital artery finally enters

(*Concluded at foot of page opposite*)

(2) Surgery of the Bovine Foot

BY

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Introduction

THE pattern of bovine foot surgery has undergone no essential change in the last couple of decades. The pathology of the foot does not alter. The relevant pathological processes are still largely suppurative inflammations which require the same fundamental measures for their relief. The value of the antibiotic drugs has now been fairly critically assessed and it must be confessed that their advent has had very little impact on this branch of veterinary orthopaedics. It is true that methods of anaesthesia have improved and facilitation of anaesthesia is a good incentive to surgery. Perhaps the most welcome change in the veterinary attitude to foot disease is the now greater readiness to undertake surgical interference. Early recourse to correct surgery is the best contribution veterinarians can make to the treatment of bovine foot lameness. Whereas such prompt treatment is dictated by economic considerations, it is also abundantly welcome on humane grounds; chronic inflammatory disease of the foot has often been allowed to cause much suffering which could have been obviated by early diagnosis and bold treatment. In this connexion the development of a technique for amputation of the digit was a milestone in surgery of the bovine foot. This is undoubtedly one of the regrettably few eminently worthwhile major bovine operations that are economically justifiable. Another minor but useful development has been the realisation that pregnant cattle may be cast, restrained—if necessary, on their backs—anaesthetised with general anaesthetics, and subjected to major surgery without fear of abortion, premature delivery or death of the foetus as a sequel.

The Cause of Surgical Affections of the Foot

Trauma

It goes without saying that the foot, more than any other part of the body, is prone to injury. By providing the extremities with horny coverings, nature has taken care of the ordinary hazards of existence. The interdigital cleft, however, remains a vulnerable area and the superficial position—anteriorly and postero-medially—of the capsule of the corono-pedal articulation is of vital importance. From the disease aspect an unfortunate result of the horny box at the extremity of the limb is that infection, once introduced, may extend far and do irreparable damage before the inflammatory process erupts. The foot is, of course, a highly vascular structure and, being a tactile organ of some

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The Applied Anatomy of the Bovine Foot.—*Concluded.*

a foramen on the axial aspect of the extensor process of the third phalanx within which it forms an arch that runs parallel to the distal border of the bone. It may here be called the artery of the third phalanx.

Two smaller vessels run down the respective borders of the suspensory ligament as the medial and lateral deep volar metacarpals. They cross the sesamoids and become the medial and lateral digitals which run down the abaxial volar aspect. Each has an anastomosis with the arteries of the first and second phalanges and with the bulbar arteries, and end by joining the artery of the third phalanx. There are some small dorsal digital vessels that have several anastomoses with the volar arteries.

Arteries of the Hind Foot

The digital arterial pattern is the same as that of the fore foot but the main parent comes from the front of the metatarsus. This is the dorsal metatarsal artery, the continuation of the anterior tibial, which runs down the dorsal metatarsal groove with the deep peroneal nerve. It enters the interdigital space as the dorsal common digital and is joined by the plantar digital artery and branches like its homologue of the fore limb. Comparable to the deep metacarpal arteries, there are the superficial plantar metatarsals from the saphenous that run down each side of the flexor tendons and into the digits as the medial and lateral digital arteries. They are arranged as in the fore limb.

The plantar digital artery mentioned above comes off the medial metatarsal. It runs behind the flexor tendons into the interdigital space, inclines dorsally and joins the digitals as well as the dorsal common digital.

Veins of the Fore Foot

There is a coronary venous circle in each digit. Dorsal digital veins arise from it; run up the front of the digits, join, and form the dorsal metacarpal vein. Volar digital veins are satellites of the arteries. They meet in the interdigital space and form the volar common digital vein which becomes the ulnar vein. The medial and lateral digital veins run along in front of each satellite artery.

Veins of the Hind Foot

There are no significant differences from the arrangement in the fore foot. The dorsal digital is large. It inclines outward at the fetlock where it is joined by the lateral digital to form the dorsal metatarsal vein. The plantar digital veins may not unite to form a plantar common digital.

importance, it requires an abundant nerve supply too. The result of this vascular and nervous combination is that inflammatory disease of the foot may be an acutely painful process. The reduction in milk yield and loss of flesh occasioned by foot lesions is tremendous.

Trauma, then, is the prime cause of surgical foot disease. Its consequences depend on the nature of the injury and its location. Penetrating wounds of the skin and hoof which allow entry to the deeper structures are the most important. As regards the site of penetration of the sole it should be noted that the anterior half of the sole is covered by relatively thick horn, above which lies the corium and os pedis; the horn thins out posteriorly where it is overlain by the plantar cushion. The intermediate area of sole lies beneath the articular area of the corono-pedal and naviculo-coronal joint, and the bursa of the navicular bone. Protecting these synovial sacs from direct ventral trauma is the deep flexor tendon itself. Concussive trauma due to rapid movement over hard surfaces which contributes to periarticular disease in the horse is of no moment in cattle and it is interesting to note in passing the absence of the non-infective arthroses or rheumatoid diseases, which are so troublesome in the horse.

Treading on sharp single objects may obviously cause penetration of the horny sole, but where cattle have to walk over loose aggregations of sharp flints, cinders or rubble, injury to the interdigital skin is very likely to occur. Unfortunately, such injuries are especially likely where genuine attempts are being made to improve farmyards, roads and gateways. Contact with lime, cement or mortar has a deleterious influence on the interdigital skin. Grazing over stubble in autumn and the now common practice of feeding kale, behind an electric fence in the field in early winter, increase the incidence of foot trauma.

The place of trauma in the aetiology of foul-of-the-foot is not clear. The disease is commonest in warm and wet summers and sometimes assumes endemic proportions on a farm. Maceration of the interdigital skin in the mud of gateways and around drinking troughs is the main forerunner of infection, but it often surprises me that the disease is not most frequent in winter when cattle are exposed to the most filthy conditions. Obviously the infecting saprophytic organism, *Fusiformis necrophorus*, will multiply in warm damp soil, and although Flint and Jensen (1951) have reproduced the lesions by injecting *F. necrophorus* into the digital artery, I have often wondered whether an epitheliotropic virus was concerned in the causation of foul-of-the-foot.

Apart from direct penetrating injury, the horny sole and interdigital cleft may be bruised by blunter objects. Furthermore, breaches in the horny hoof may occur due to irregularities of horn wear. For example, if there is excessive wear on the walls due to the walking of dairy cows over hard roads twice daily, the sole may become exposed to excessive wear and sharp pieces of gravel may then enter the thin horn and damage the sensitive sole at several points. There is great individual variation among cows in the wearing qualities of horn.

On the other hand, when the exercise of cattle is restricted for long periods by standing in stalls or pens, excessive horn growth occurs. This may be followed by splitting and fissuring and the deeper sensitive corium may be exposed and infection gain entrance.

Occasionally, not necessarily in animals which have been housed for long periods, one sees a peculiar overgrowth of horn from the lateral wall of a hind digit. This horn grows inwards towards the opposite claw and tends to give a double sole, the animal eventually treading on the inturned wall. The stimulus for this inordinate growth of horn is not known but the related corium is obviously involved in a disease process.

Cattle which have spent years indoors and are then turned out on spring pasture will sometimes grow new horny hoofs inside the old ones. For several months the old claw fits over the new like a thimble and eventually it is cast off. The affected animals are never lame.

Infection

Apart from causing bruising, and, rarely—due to violent injury—fracture of the digit, trauma is chiefly important because it may open the skin, or horn, and allow entry of infecting organisms to the subcutaneous tissues or corium. There are two types of infection—pyogenic and necrotising. *Foul-of-the-foot* or infectious pododermatitis, is a specific necrotic condition of cattle feet, and is the commonest foot disease. The infecting organisms enter debilitated skin of the interdigital cleft, usually at the junction of horn and skin and cause a gradually extending necrotic process with a pungent and characteristic odour. Eventually a necrotic core tends to slough out, an ulcer forms, and a chronic suppurative process continues. The progress of the lesion is very variable, but most cases tend to recover spontaneously. The necrotic process may be very protracted however, and when suppuration occurs faulty drainage may prolong the condition. From time to time, the disease progresses more deeply to involve the structures within or above the hoof. It may then be followed ultimately by infection of the corono-pedal joint. Instances of so-called "Blind Foul" in which there is cellulitis of the pastern but no interdigital or other "primary" lesion and which are often said to localise finally in the coffin joint, are probably cases of suppurating laminitis due to undiscovered penetration of the sole.

Suppurative Laminitis. Pyogenic infections are likely to follow injury to the skin or corium. Puncture of the sole or splitting of the wall may be followed by suppuration within the hoof. This suppurative process will tend to extend until it breaks out above the hoof, but in its progress, the pedal bone or corono-pedal joint may have become involved in the lesion. Injuries at the back of the interdigital space are always likely to be quickly followed by infection of the corono-pedal joint, while penetrations of the heel tend to cause infection of the deep flexor tendon. Such an infection may track upwards or downwards and the expansive annular ligament may cause pointing near the accessory digit.

The Diagnosis of Diseases of the Bovine Foot

• When called to a case of bovine lameness, Foot and Mouth disease must always be first excluded. The important essential in the diagnosis of foot lameness is a thorough examination of the foot. An accurate history can be quickly obtained and the animal should, whenever possible, be observed when walking on a hard level surface. The affected leg is usually obvious but the site of the lameness and the identity of the affected claw may not be so easy to determine. Hind-leg lameness is commoner than affections of the fore-leg. Since many lesions begin in the interdigital space, or affect the sole, the underside and medial side of the foot requires meticulous attention. Fore-feet may be raised and inspected fairly simply but hind feet are more difficult and must be raised with a bar and the help of two men, or the leg must be pulled up by means of a rope which runs around an overhead beam. When raising a leg with a rope it is important to raise it vertically and not to pull backwards on the limb, for if this is done the animal will have difficulty in standing. Foreign bodies in the interdigital space, the presence of lesions of foul, and ulcers or sinuses above the coronet may be satisfactorily investigated in this way. If the animal is difficult or if a thorough investigation is impossible, the animal should be put down by Reuff's method, the feet tied together, thoroughly scrubbed and examined. The outcome of veterinary attention would be materially improved if there was a greater readiness to put animals down for diagnostic purposes. Sinuses should be probed to determine their extent and direction. The sole should be pared and any discoloured foci explored with a "searcher".

Treatment of Foot Conditions

I. Chiropody

The prevention of foot disease in cattle becomes largely, therefore, an avoidance of trauma. Feet should be kept as dry as possible and moderate exercise over hard surfaces will keep the horny hoof in condition. Loose rubble, cinders and flints are unsuitable for farm roads which have to be traversed by cattle. Cattle which cannot be exercised sufficiently require constant attention to their feet. For this purpose, cows should be restrained in dorsal recumbency and the overgrowth of wall removed with the plane. Excessive horn is cut off with drawing knife or hoof pincers. Heavy bulls may be treated standing with the feet placed in turn on a block of hardwood and the excess horn "chopped off". Bull stocks are very useful in the treatment of foot conditions and allow proper shaping of the hoof by planing up to the heel.

II. Foul-of-the-Foot

The aim should be to remove necrotic tissue and provide drainage. An antiseptic dressing, preferably a sulphonamide, should be applied and the foot bandaged. Such cases are usually treated with sulphamezathine parenterally but a critical assessment of sodium sulphapyridine, which was previously much used (Forman, 1946), failed to demonstrate a real superiority over simple surgical measures (Roberts *et al.*, 1948).

There is little doubt that foul-of-the-foot is largely self-limiting and the occasionally protracted case should respond to débridement and provision of drainage. To my mind, the chief disadvantage of using sulphonamide drugs by injection is that a proper initial examination of the foot may not be carried out. Cases will be treated parenterally in which there is no likelihood of recovery without surgery. Cases of acute lameness with interdigital lesion and marked swelling around the coronet should always be regarded as probable instances of corono-pedal arthritis and the wound thoroughly investigated and the sinus probed. Corono-pedal arthritis, or deep disease of the foot, involving the navicular bursa or tendon sheath, will not respond to chemotherapy. They must be treated surgically; in such cases the mere provision of drainage is usually not sufficient and amputation of the digit will be required.

III. Suppurative Laminitis

This results from penetration of the sole by a chance sharp object or by multiple injuries from gravel through thin soles, or from horn fissures—sandcracks. The typical syndrome of pus in the foot, so familiar in the horse, follows. Cases of thin sole and "gravelling" are obvious. The offending material should be removed, the sole pared down and pus released. The foot is then bandaged. Whenever there is marked lameness and no obvious lesion the foot should be searched for pus and if found, ample drainage provided. If drainage is not provided soon enough, the disease extends into the deeper tissues and tends to involve particularly the tendon sheath and extend up the legs with formation of multiple abscesses due to *C. pyogenes*. Sapraemia and pyaemia, lung abscesses, abortion or endocarditis may follow. Corono-pedal arthritis and necrosis of the pedal bone is also likely. Where proper drainage is not soon followed by improvement, bone caries, or arthritis or teno-vaginitis is probably present and amputation will be required.

IV. Non-infective Laminitis

A word must be said of this condition which occasionally affects young bulls being prepared for show or high yielding cows on very concentrated diet. It affects several, or all feet, and causes marked characteristic lameness and a severe general reaction. The animal's feed must be cut, a saline purgative given together with antihistamine drugs. Chronic distortion of the hoof, which will require recurrent attention, may follow.

V. Interdigital Proliferations

The development of sessile growths which result from proliferation of the subcutaneous connective tissue of the interdigital space has been described by Frank (1960) but British veterinarians have long been familiar with this troublesome condition. The aetiology is obscure but when the growths reach a certain size they become pinched by the claws during movement and the animal is lame. Sometimes

ulceration and infection occur and make lameness more pronounced. The infection is sometimes associated with *F. necrophorus* when the lesion shows caseation necrosis and gives off the typical offensive odour. In the early stages of development these proliferations may easily be missed unless the feet are thoroughly examined.

The treatment is surgical. The animal must be cast, and the feet tied together. The feet are cleaned (often more than one is affected) and the lesion infiltrated with local anaesthetic. The growths are then liberally excised, and the foot bandaged. The lesions are quite vascular and they may be conveniently excised by means of the thermocautery.

VI. Fracture of the Phalanges

Most of the pedal fractures follow bone necrosis and are a sequel to foot infection. Fracture of the os suffraginis may be due to direct trauma. A German veterinarian, Numans (1958), claims to have seen 52 pedal fractures in grazing cattle—mainly in May and June—in 5 years. One wonders whether these were predisposed to by oestrogenic substances in herbage or whether fluorosis might have played a part. Certain diagnosis of fracture of the os suffraginis, coronae or pedis requires radiography.

There is little doubt that the healing of phalangeal fractures is protracted because of movement and concussion due to contact of the related claw with the ground. For this reason Frank favours amputation of the affected digit, but Numans (*loc. cit.*) introduced a novel treatment of resting the affected digit; he shod the normal hoof and screwed a 4 cm. piece of wood to the shoe, thus raising the affected digit clear of the ground. This enabled the animal to move freely after shoeing and results were good.

Amputation of the Digit

I. Indications

This operation is required when pyogenic infection, which may have followed direct trauma, or extended from a foul lesion, or from pus in the foot or an infected sandcrack, involves the deeper structures of the foot and cannot be relieved by other means. To get maximum benefit from the operation, it must be performed early. In cases of doubt, radiography may demonstrate certain involvement of the coronopedal joint or, occasionally, pathological fracture of one of the digital bones. Foot sinuses, whether from the sole or interdigital spaces or coronet, should be adequately probed and when the sinus track leads on to bone recovery is unlikely without amputation.

In cases of corono-pedal arthritis—which is the chief indication for amputation—there is, of course, acute lameness with upturning of the affected toe, and marked coronary swelling.

II. Anaesthesia and Restraint

Operation on a hind-limb is more often required, and the available methods of anaesthetising the hind digit are easier than those required for operation on a front digit. In my opinion, irrespective of the digit affected, the animal should be cast so that the affected digit is uppermost. I am aware that a claw can be removed quite readily from a standing patient by means of embryotomy wire but I think the lesion demands a more exact surgical approach.

Anterior epidural anaesthesia is eminently suitable for removal of a hind digit. Up to 160 c.c. of 2 per cent. solution of procaine may be required. The animal first should be given a sedative in the form of 30 to 45 g. of chloral hydrate in dilute solution by drench. More prolonged sedation, as with trimeprazine tartrate, is indicated so as to obviate too early attempts at regaining the standing position. There is always the risk that an animal under the influence of anterior epidural anaesthesia will, in its struggles to get up, rupture its teres ligament and dislocate its hip. Out of 20 cases given this form of anaesthesia I have seen this happen once.

My former colleague, C. W. Brown, introduced a practical method of hind foot anaesthesia. It involves perineural injection of the external popliteal and posterior tibial nerves. The external popliteal is injected below the stifle joint where it passes quite superficially over the head of the fibula—before it dips down between the extensor pedis and flexor metatarsi muscles and divides into its terminals—the anterior tibial and musculo-cutaneous (deep and superficial peroneal) nerves. The posterior tibial nerve is injected (as in the horse) a hand's breadth above the summit of the os calcis on the medial side of the limb, just in front of the Achilles tendon. In common with all techniques which involve perineural infiltration, considerable practice in the method is necessary but I believe Brown's technique is a most useful advance.

As a third alternative a hind (or fore) digit may be anaesthetised by nerve block of the related digital nerves above the interdigital cleft. Each digit is supplied by 4 digital nerves—2 at the front (dorsal digital nerves) and 2 at the back (plantar or volar digital nerves). Gold (1941) infiltrates the medial dorsal digital nerve by making superficial and deep injections in the mid-line above the pastern. A similar injection on the posterior aspect, again in the mid-line, blocks the medial volar digital nerve. The lateral dorsal digital nerve is reached by a superficial injection midway between the first 2 injections on the lateral aspect of the pastern. A similar injection half-way between the last described and the posterior injection will block the lateral volar digital nerve. Going around a half-circle, it will be seen that the injections are made at 0°, 90°, 135°, and 180°. About 40 c.c. of local anaesthetic will be required.

A disadvantage of field infiltration is that where there is considerable acute inflammatory swelling of the pastern it may be found very difficult to make the injections.

Some practitioners use general anaesthesia and for this operation there is a choice of chloroform, chloral hydrate, sodium pentobarbitone or sodium thiopentone. In veterinary hospitals where a qualified anaesthetist is available, cyclopropane or halothane may also be used after intubating under thiopentone.

III. Surgical Technique

When epidural or perineural anaesthetic tech-

niques are employed the affected foot should be clipped and very thoroughly scrubbed clean while the anaesthetic is taking effect. In methods involving general anaesthesia it is preferable, whenever possible, to clean the foot before administering the anaesthetic. Except when the animal is intubated, the less time it is under the influence of a general anaesthetic, the better. A tourniquet is put around the metacarpus or metatarsus. Sterile drapes are then applied so that the affected claw and pastern alone are exposed.

The aim of surgery is to amputate well above the lesion. This involves making the bone section through the lower-third of the os suffraginis. As much skin and subcutaneous tissue as possible are retained so that subsequent granulation over the exposed bone is expedited. An incision is made right around the affected claw above the coronary band. Where there are discharging sinuses the incision must be above them. The knife is carried right down to the bone; the skin flap is then heavily retracted upwards and the subcutaneous tissue is cut through until the suffragino-coronal joint can be seen. This joint is disarticulated and the claw removed. The extremity of the os suffraginis is now exposed and removed by sawing with embryotomy wire which has been placed deep to the bone stump. Any portion of devitalised tissue which remains is excised. The tourniquet is now removed and the two main bleeding arteries are picked up with artery forceps and ligated. Ligation is preferable to pressure bandage. It is usual then to apply sulphonamide to the wound and then a layer of gauze. Ample cotton wool is now applied and the foot bandaged. Finally, the affected leg is enclosed in sacking to protect it from gross soiling.

The dressing should be removed in 48 hours, any blood clot removed and the wound re-dressed and re-bandaged. Subsequent dressing should be at 2-3-day intervals until the bone is covered by firm granulation tissue. The cow will not go sound until from a month to 6 weeks after the operation. When penicillin first became available it was found that daily dressing of the amputation wound with penicillin, while it controlled the bacterial flora, did not shorten the period of healing. An early exponent of digital amputation was the late W. Kendrick of Tarvin. He put on an initial dressing of Bipp and took off the dressing a fortnight later. He obtained excellent results.

It will be seen that no mention has been made of vertical incisions to form skin flaps; they are unnecessary. The writer is also not in favour of operations to preserve the coronary band—with a view to allowing growth of a new claw.

When the operation is performed in good time the results are excellent. Continuing severe lameness and deep seated pus indicate complications. The other claw may have become involved in the disease process, or inflammation may have extended into the tendon sheath. In the former case, the prognosis is grave but in the latter, the animal must be cast and anaesthetised again with a view to promoting drainage at a higher point. The corresponding dew claw may require to be amputated to give access to the tendon sheath above the annular ligament. So long as further arthritis does not develop there is hope of recovery. When there is rapid upward extension of cellulitis, arthritis of the fetlock is likely to supervene and in such a case the animal must be slaughtered.

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THE ROYAL COLLEGE OF VETERINARY SURGEONS

Temporary Building

The present office of the College at Red Lion Square will be closed at 5 p.m. on the evening of Thursday, December 29th, and will re-open at the new temporary address—College House, Wright's Lane, Kensington, W.8.—on Monday, January 2nd, 1961, at 9.30 a.m.

It is asked that enquiries and correspondence may be kept to the minimum during the week immediately before and after the move.

Wright's Lane runs south from Kensington High Street along the side of Messrs. Pontings. College House is a modern office block on the left towards the bottom of Wright's Lane, when approaching from Kensington High Street. The College accommodation will be on the first floor. Kensington High Street Station (District and Circle lines) is immediately adjacent to the temporary College building.

(3) Diseases of the Bovine Foot

BY
COLIN WOOD
Dumfries

SUMMARY.—The examination and paring of feet as carried out in practice are described. Drugs and dressings are evaluated. The familiar conditions of the foot dealt with are: foul-of-the-foot; laminitis; foreign bodies and wounds; interdigital dermatitis.

The less familiar conditions of the foot dealt with are: sandcrack; joint-ill of the pedal joint; post-parturient knuckling of the fetlock joint.

Attention is drawn to foot lesions which are symptoms of systemic disease.

Introduction

WHILE "Diseases of the Bovine Foot" are responsible for a large proportion of the cases attended by the veterinary surgeon in agricultural practice, it does not appear, from a short study of the relevant literature, that these conditions have attracted much attention from research workers. Furthermore, enquiry made of veterinary students graduating to-day has shown a complete lack of information regarding the common conditions of the bovine foot met with in practice. This cannot be said of the equine foot which has had its share of research and continues to dominate the veterinary curriculum.

Examination and Paring of Feet

While taking the case history it is well worth while keeping the animal under constant observation. During this time the animal may provide evidence of the type of condition present. The stance is most important. "Paddling" for example would indicate that more than one foot was affected, as in laminitis; abduction of the leg so that the weight is taken on the inner clit as in painful conditions of the outer clit is diagnostic, as is standing with the toes of the hind feet on the very edge of the stall, so avoiding pressure on the tender heels.

The case history should be directed towards the type of onset of the condition. Was it sudden, such as would be expected in the case of gross F.B. or foul-of-the-foot; was it progressive suggesting build up of pus pressure; or was it insidious, starting as a dull stiffness of both hind legs and settling out as a very lame hind foot such as is seen in sub-solar necrosis with infection?

Closer examination of the foot will reveal gross abnormalities such as overgrowth of horn, gross swelling round the coronary band, cracks of horn, rings on horn and sinus formation. The coronary band calls for detailed examination for evidence of injury, hoof separation or localised swelling with pain, the latter frequently indicating infected track running up from the sole.

Further examination of the foot requires some degree of restraint. This can best be done in the hind leg by a rope attached to the hock passed over an overhead beam and then under the hock, thus giving a block and tackle effect, enabling one man to hold up the leg with ease. This rope should not be tied, but held so that if the animal casts itself it can be released and so avoid a fracture dislocation type of accident. The foreleg is not so easily dealt with. It may be lifted manually, but this requires some degree of physical ability. A rope round the cannon bone and over a beam has proved useful on occasion. Casting by Reuff's method is preferable to prolonged struggling.

Having raised the foot some equipment is necessary for its detailed examination. This consists of a Quittor knife, a rasp of the modern Surform variety, hoof cutters with simple joint and a clasp knife. The Quittor knife is used to follow up tracks, the rasp for removing hard horn, the clasp knife for removing soft heel horn and the cutters for reducing the wall.

The foot is now cleaned by using the Quittor knife to remove all dirt and a thin layer of horn off the sole, so presenting a fresh surface for careful scrutiny. The shape of this surface should be noted. A flat "dropped sole" is more prone to trouble than the normal concave surface. All cracks, tracks and discoloured areas are noted and particular attention is paid to the junction of the laminar and solar horn. All abnormalities should be investigated by removing horn until sound horn or soft structures are exposed. Tapping or applying pressure to the thin pared-down sole assists in the determination of the seat of pain. The interdigital cleft is cleaned out and examined for foreign bodies, wounds or inflammatory changes. Where the cleft is clogged up with necrotic debris this can best be removed by drawing a soft tow rope quickly to and fro between the digits.

The successful treatment of many foot conditions depends largely on the veterinary surgeon's ability to pare out feet. There are 4 basic principles to be followed.

(1) Where the animal has 2 affected hind feet, attend to the worse affected first and leave the other alone so that the animal has at least one moderate foot on which to move around. Two or 3 weeks later when the animal is taking weight on the treated foot the other may be dealt with. If both feet are pared out at the same time there is the possibility of turning the animal into a useless cripple.

(2) Where there is only one clit affected take as little horn as possible off the sound clit so that the animal may have something left upon which to stand. The affected clit can be so reduced in size that for all practical purposes it does not come into contact with the ground during progression. This resting of the affected clit assists recovery, so that one is tempted to suggest surgical shoeing of the bovine foot as worthy of investigation.

(3) Do not be afraid to remove under-run horn

even to the extent of stripping the sole or removing laminar horn from the coronary band to the bearing surface.

(4) Try to retain the normal shape of the foot as far as it is possible, *i.e.* pare most horn off the inner aspect of the clits and clip back the toes so that when the animal takes weight on the foot the clits will tend to splay.

Drugs and Dressings

In theory a multiplicity of drugs are advocated for the treatment of foot conditions in the bovine animal, but in practice good results are obtained by a few simple drugs suitably applied at the right time. Sulphadimidine continues to be the most popular drug used because of its specific action in "foul"—the most common condition of the bovine foot. On occasion one sees a haemorrhagic syndrome following its use, but this is not important since spontaneous recovery is the rule. The systemic use of antibiotics is rarely indicated and their local application gives disappointing results. Liquor antimony trichloride (butter of antimony) as an escharotic is superior to all others and is used for the control of proliferative inflammatory reactions so common to the bovine foot. For prolonged astringent therapy 5 per cent. copper sulphate solution gives good results. This is particularly useful in the slow healing "foul" where the slough has been large or where extensive areas of under-run horn have been removed exposing areas of so-called "proud flesh."

The excessive use of poultices is to be deplored. Quite often an abscess is relieved by paring out, and the subsequent poulticing draws the soft matrix out through the aperture in the horn so blocking the recently established drainage. Occasionally, where the hoof horn is very hard, poulticing for 1 or 2 days will soften the horn and allow of more easy paring out of the foot. Bandaging of the foot "to keep dirt out" cannot be entertained as rational since most conditions of the foot to be bandaged are infected and the bandage prevents drainage. Bandaging is indicated following surgical procedures and for the control of accidental haemorrhage.

Foul-of-the-foot

Foul-of-the-foot, referred to as "clit-ill" by farmers in South-West Scotland, is the most common cause of lameness in the bovine species. It is an acute inflammatory reaction of the interdigital cleft or coronary band caused by *Fusiformis necrophorus*. This infection is thought to gain entry to the soft structures either by injury or by wet, dirty conditions of the foot, reducing tissue resistance. This may well explain many cases of foul-of-the-foot, but in practice one is impressed by the number of instances of foul where foot conditions are ideal and examination of the foot fails to produce evidence of trauma though the clinical signs are typical. This is frequently observed in epidemics in young stock kept on a high plane of nutrition. As a practitioner I sometimes wonder what the story would have been had not the sulpha drugs proved specific for this condition.

Whilst the sudden onset of an acute lameness with tense swelling of the soft structures at the heel or coronary band may lead one to suspect foul-of-the-foot, an accurate diagnosis can be established only by lifting the foot and eliminating other causes of lameness.

The prognosis in the early case is good, but in the more advanced case caution is required until the response to therapy has been observed.

Treatment consists of the intravenous injection of 15 c.c 33⅓ per cent. solution of sulphadimidine per cwt. bodyweight. This may be repeated in 3 to 4 days if thought necessary. Sometimes a necrotic "core" in the interdigital cleft may require to be removed. Where the slough has been large, 5 per cent. copper sulphate as an astringent foot bath is useful. Occasionally a good response to treatment is followed by a moderate lameness, and careful examination of the interdigital cleft shows a very small sinus discharging a little serum. Presumably some necrotic material deep in the interdigital cleft has failed to slough and has healed over. Such a case requires plenty of time for recovery and may be assisted by intramuscular injections of streptomycin. Where necrosis has extended to ligaments, bones and joints, amputation of the digit is indicated.

Efforts to prevent foul-of-the-foot are directed towards drying up gateways and trough surrounds and preventing animals standing back in the dung channel. They consist of concreting yards, dumping shell lime in gateways and using a wire stretched the length of the dung channel to keep the animals up on the standing. Foot baths of copper sulphate or formalin are used to harden up the interdigital cleft, but unless kept efficient they in themselves may be a source of trouble. All these efforts are worth while if only to improve general foot hygiene.

Laminitis

Acute laminitis is an inflammation of the sensitive laminae of the foot and may affect either the hind feet or all 4 feet. Chronic laminitis is a sequel. Toxaemia, usually arising from metritis, is the most common cause of this condition in cattle. Excessive bodyweight, too much standing or travelling on hard surfaces and dietetic errors also play their part in making this a common condition.

The symptoms of acute laminitis are temperature elevation, sweating, trembling, and when the animal is forced to move, a crouching gait with careful placing of the feet. Paddling in the stall is seen in the less acute case.

In chronic laminitis the feet are overgrown and there is a varying degree of dropped sole. They also show characteristic rings on the laminar horn, parallel to the coronary band.

Treatment of the acute stage consists in eliminating the cause of the condition, together with the parenteral administration of anti-histaminics. Temporarily reducing the concentrate feed, and keeping the animal in a box with a depth of old bedding, assist recovery.

In the chronic stage, treatment is directed towards the control of secondary foot trouble by paring out the

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feet as best one can. This proves difficult in most cases since, with the dropped sole condition, no matter how the foot is pared and shaped the animal invariably has to stand on the sole with the wall of the foot free of the ground. It is better to leave the wall overgrown to take the weight, rather than to pare it down to make a neat looking foot subject to bruised sole.

Sometimes the inflammatory reaction at the coronary band is such that partial separation of the horn takes place. Several months later, as this fault is growing out, a widening crack parallel to the coronary band and usually two-thirds of the way down the wall may cause lameness. This lameness is due to a constricting pressure necrosis at the line of contact of the very hard old horn and the new horn. Furthermore, grit works its way into the fault, introducing infection which leads to pus formation. There is also a tendency to movement at the site of the fault during ambulation, because of the long toe and the weakness at the line of the fault. Removal of the wall horn below the line of the fault gives good results.

In South-West Scotland there is a type of laminitis associated with bringing heifers at parturition on to concrete standings for the first time in their lives. In this laminitis the solar matrix appears to be most involved, and for the purposes of this paper it will be referred to as solar laminitis. The factors responsible for solar laminitis are the hard standing, the stress of parturition and milk production, and the introduction to concentrate feeding.

The symptoms are stiffness, loss of condition, and when the changes progress to the stage of sub-solar necrosis with separation of heel horn, secondary infection produces marked lameness. The outer clits of the hind feet are affected most often, but in very severe cases, all 8 clits may be affected.

Treatment of the early case consists of paring out the affected clits, so reducing their size as to allow the animal to stand on the inner clits of the hind feet. This, together with lying out at grass or in a box with a depth of old bedding gives satisfactory results. Where sub-solar necrosis and infection are present then stripping the sole and dressing with butter of antimony is indicated. The difficulty encountered in advanced cases is that the affected clits become so enlarged by chronic inflammatory changes that it is impossible to keep them out of contact with the ground. Amputation would be useful in these cases but for the bi-lateral nature of the condition: *i.e.*, if the outer clit of the left hind foot required amputation then it would not be long before the outer clit of the right hind would require similar attention. Many of these advanced cases are put on prolonged copper sulphate foot bath therapy and drafted out of the milking herd.

The economic losses from solar laminitis in the past have been such that many farmers adopt preventive measures. Two preventive measures are practised with some success. Some farmers house the bulling heifers in byres for a few weeks in the winter prior to calving, so that they become accustomed to the hard standing. Others calve the heifers in early autumn and lie them outside as long as possible so ensuring that the animals are fully recovered from parturition and are accustomed to the concentrate feed before being subjected to the hard standing.

Many cases of overgrown feet are the result of laminitis but some, especially those where the wall of the outer clit tends to curl under the sole may well be of an hereditary nature. These overgrown feet require regular paring out. Some eventually take up a block-like shape which allows of natural wear of the wall, but many require long paring out sessions.

Foreign Bodies and Wounds

Foreign bodies may be either gross such as nails, stones and twigs, or particulate, such as sand and grit. The larger foreign body either penetrates the foot or becomes lodged in the interdigital cleft. Treatment consists of removing the offending object, and where penetration has taken place the track has to be pared out or followed up until the matrix is reached. During the paring out the horn should gradually be sloped towards the drainage aperture, where it should be paper thin. This treatment is also applicable to wounds of the foot. When the foreign body has lodged in the interdigital cleft it is as well to pare out the foot, thereby splaying the clits and preventing a recurrence. Sulphadimidine injection is worth while in those cases involving the cleft. Where sand or grit has worked its way into the matrix of the foot, the result is a sub-solar abscess. Treatment is based on the provision of adequate drainage. Butter of antimony on a cotton wool swab lightly applied to the exposed area reduces the incidence of cases of proliferative tissue formation.

Interdigital Dermatitis

Locally referred to as " scad " or " scald," this is an inflammatory reaction without swelling of surrounding structures which most frequently affects the posterior end of the interdigital cleft. It may either be acute or chronic in form. In the acute case the animal is markedly lame and examination shows an inflammatory reaction of the inner aspect of the heels with separation of horn. By lifting this horn the acutely inflamed matrix may actually appear to steam, so great is the reaction. If this remains untreated dirt finds its way between the separated horn and matrix and proliferative tissue grows out into the interdigital cleft, so developing into chronic interdigital dermatitis with only slight lameness. Both the acute and chronic stages are treated by paring out the foot, removing all under-run horn and lightly applying butter of antimony to the exposed matrix. Five per cent. copper sulphate foot baths are a useful follow-on therapy.

I consider fibrotic growth in the cleft to be a type of chronic interdigital dermatitis, most probably caused by the shape of the clits tending to set up a fold of the interdigital integument. Continued chafing of this fold during ambulation, together with the action of grit and infection leads to proliferation of connective tissue so forming the growth. Chivers, however, has suggested that this arises as the result

of excessive strain on the interdigital ligaments with a spread of the clits when the foot takes the animal's weight. The interdigital space so stretched, fills up with connective tissue and when the foot is raised the clits come together and force this connective tissue down into the cleft.

Treatment of the small fibrotic growth entails paring out the foot, curetting the growth, and dressing with butter of antimony. Where the fibrotic growth is large, surgical removal is necessary.

Other Conditions

Three not quite so common causes of bovine lameness are sandcrack, joint-ill of the pedal joint, and post-parturient knuckling of the fetlock.

Sandcrack most commonly seen on the anterior aspect of the outer clit of the forefoot is usually symmetrically bi-lateral. Lameness is due to pressure necrosis and infection with pus formation. Curetting out the sandcrack and dressing the fractured coronary band with butter of antimony gives good results, but several months are required for the wall horn to grow.

Joint-ill occasionally affects the pedal joint in the calf, and since there is no swelling in the early stages most cases are passed off at first by the attendant as "just a knock." This joint is inaccessible so far as antibiotic therapy is concerned and amputation is the only practical course.

Sometimes post-parturient knuckling of the fetlock joint does not resolve itself, and this leads to pressure necrosis of the coronary band by the anterior walls of the clits. Clipping back and paring down the toes of the affected foot, to allow the walls of the clits to take up a more upright position, has been tried with little success.

Symptom of Systemic Disease

Bovine lameness may be only a symptom of systemic disease. Foot-and-mouth, and mucosal disease are 2 infectious diseases with lesions of the interdigital cleft and coronary band.

A non-infectious disease photosensitisation may cause lameness in the animal with white skin round the coronary band. In this condition inflammation of the cutaneous structures gives rise to an associated laminitis of the coronary band. If this reaction is sufficiently severe then separation of horn may occur with subsequent predisposition to lameness.

Reference

CHIVERS, W. H. (1956). *Vet. Med.* **52**. 579.

THE SPEAKERS' INTRODUCTION

The Chairman, Mr. W. A. Whiteford, said that the subject for presentation was diseases of the bovine foot. In introducing Mr. Taylor, who was Senior Lecturer in Anatomy at the Royal (Dick) School of Veterinary Studies, he said that Mr. Taylor was something of a cherished institution in the memory of all those who had had the fortune to study anatomy at the Dick.

Mr. Taylor, presenting his paper on "Applied Anatomy" said that he had looked through the annals of the proceedings of the B.V.A. and the N.V.M.A. as far back as 1938 when it was last held and in no part of the proceedings, scientific, prosaic or otherwise, had he found anything at all to do with anatomy, so he was very pleased to be asked to speak to-day. He complimented his colleagues in the Anatomy Department at the Royal (Dick) School of Veterinary Studies for the most beautiful demonstration they had arranged.

The anatomy business was a pretty old science; it was the oldest of all sciences. Many branches of medicine were more glamorous; they often revealed sensational things, but all would agree that it was recognised that anatomy was the basis of all medicine.

A fellow called Aristotle, who lived from 384 to 322 B.C., which was quite a long time ago, started the science of anatomy. The word itself was attributed to him. He dissected, according to historians, 49 animals. He was the first man to identify the compound stomach in the ruminant. One day when he was busy working, a friend who was passing asked him "What are you doing?" Aristotle replied: "Anatomy," which means to cut apart and to-day the same word was in use.

Despite the maturity of the science, everyone was not entirely together on nomenclature. Certain terms which appeared in the paper would not be understood, depending on which school a person had attended. He would translate these during the showing of slides.

The first slide showed the foot of a sheep foetus of 16 weeks gestation. This had been chosen instead of an adult because certain features of a section of the foot and the details of tendons and ligaments would only confuse and perplex a lot of people, including himself.

Further slides were then shown and explained, of the structure of the skin, the front dorsal aspect of the forefoot, the nerves, front and back view, the lateral aspect of the limb, the medial view, etc.

Mr. I. F. S. Hay (Cirencester) commented that Mr. Taylor had said that in the hind foot there was a deep nerve below the extensor tendon; afterwards, he had said that all structures were subcutaneous.

Mr. Taylor replied that that was the only deep structure encountered in either foot, so far as the nerves were concerned. The deep peroneal or the anti-tibial nerve was deep and lay below the extensor tendons.

Mr. K. O'Sullivan (Milk Marketing Board) asked a question with regard to full anaesthesia of the foot and Mr. Taylor replied that that was for the other speakers to answer.

The Chairman, in introducing Dr. Arthur, said that he was Reader in Veterinary Surgery at the Royal Veterinary College and had made a name for himself in the last few years as a contributor on a large number of subjects in surgery which had given a great deal of assistance in the advancement of surgery in large animals.

Dr. Arthur, presenting his paper "Surgery of the Bovine Foot," said that he welcomed the opportunity of speaking on a subject which had interested him for 20 years.

In orientating one's thoughts to the surgery of the bovine foot, one could not do better than ponder the dicta of Osler and Celsus which were, respectively, "As is our pathology, so is our practice," and "where there is pus, let it out." If by the term pathology, the former meant morbid anatomy, he would disagree. What was required was the application of the principles of pathology to the living animal, which was quite a different thing from recognising pickled specimens in museum pots. With due humility, he modified it to "As is our diagnosis, so is our daily bread."

The purpose of the paper was to draw attention to the relatively simply pathological process involved in foot disease and to emphasise that simple treatment applied at the correct time was often successful. There was a danger in veterinary surgery to-day of the development of an unhealthy dilettantism, a type of flamboyance based on a shaky foundation of new drugs, costly equipment, and rather fancy anaesthetic practice. If surgery were to survive in the service of agriculture, it must be economical and would then require early diagnosis and sound treatment.

Surgery of the bovine foot was an unspectacular branch of clinical veterinary science and required considerable will power. It involved a tremendous amount of sheer hard work, often under very unpleasant conditions. It was very time-consuming and not particularly remunerative. It required adequate lay help and taxed the ingenuity of the

surgeon in matters of restraint and anaesthesia. For those reasons, it was a relatively neglected branch of surgery, yet it was rewarding to the extent that genuine effort and a deductive method often succeeded.

He had sometimes thought that a veterinary surgeon's approach to foot surgery was a useful indicator of his grasp of surgical pathology and of his general competence as a practitioner. It was probable that, before the advent of field stations at veterinary schools, the practical aspects of bovine foot surgery were not well taught and that, consequently, veterinary surgeons did not approach foot problems with sufficient confidence. That should no longer obtain. Due regard was now given to the subject, and it was possible for teachers to demonstrate foot surgery in a comprehensive manner.

In the paper, in the section on diagnosis, radiography was not mentioned, although that had value at times, as was readily conceded. Its usefulness was mentioned later in connexion with fracture of the phalanges; nevertheless radiography was not likely to be readily available on the farm, and diagnosis should always be made on the basis of a careful clinical examination.

Regarding what had been called "conservative" treatment of corono-pedal arthritis, infection of the navicular bursa, etc., it must be admitted that amputation of the digit was a very drastic treatment and when one was sawing through the suffraginal bone there was always the fervent hope that a similar calamity would not befall the other claw. One heard it said from time to time by knowledgeable farmers that amputation was unnecessary and, if the cow was persevered with long enough, arthritic suppuration would cease, an ankylosed joint would result and weight would again be taken on the digit. If that line of treatment was considered for corono-pedal arthritis, as for instance, involving the hind claw of a bull—a long period of lameness must be condoned. It would be not a case of mere rest but rather of frequent irrigations of the sinus or of a definite surgical attempt to provide drainage as for example by resection of the plantar aponeurosis and shoeing of the adjacent claw. That would be just as troublesome for the veterinary surgeon.

It would be noted that he had said nothing about genetics in the paper. It was probable that that came into the picture, that conformation had a bearing on foot disease and that there were variations in wearing qualities of horn, which was known in individuals and possibly in strains and possibly in breeds. He did not feel competent to speak on that aspect.

There were two items in the paper to which he wished to draw special attention. The first was Brown's method of hind foot anaesthesia. Brown had spent some considerable time dissecting the hind limbs of cattle and tracing the nerves to their origins. He had reached the conclusion that it would be practicable to achieve complete anaesthesia of the foot by blocking nerves higher up. He had suggested perineural injection of the external popliteal and posterior tibial nerves. Blocking the posterior tibial in the horse produced anaesthesia of both plantar nerves, and therefore, of the foot, but the same thing did not hold with cattle. The external popliteal nerve had to be blocked. When those two nerves were blocked at points distant from the foot, anaesthesia was obtained. That might have use in diagnosis as well as in surgery.

The next interesting and novel thing he had come across when perusing the literature was a method described by Numans of Germany of resting the foot by taking the neighbouring digit clear of the ground by means of applying a shoe on a piece of wood. He described that method for fractures of the phalanges. This was difficult to deal with and was often treated by amputation. Numans' method might have some application in treating several affections of the digit and might be worthy of a try-out. It did, however, need the services of a smith.

He recommended anterior epidural anaesthesia as a method of anaesthesia of the hind digit. He had seen a cow ruminating when it was having its os suffraginis sawn through, under this method. It was quite remarkable.

He had said nothing about limb prosthesis in cattle. As long ago as 1942, he had helped Professor Wright to fix an artificial limb to a cow. The idea was to keep the cow, which was 7½ months pregnant, going until it had calved. Considerable trouble had been taken in consultation with colleagues in the department of engineering to fasten a suitable artificial limb. That particular case had illustrated the ingratitude of the bovine species, because it never put any weight on the limb but just swung it about and, to make matters worse, 2 days after the limb had been fixed, the cow aborted. *C. pyogenes* was isolated from the foetal stomach. If suppurative conditions in the hoof were allowed to go on too long, *C. pyogenes* abortion could occur.

Attention had been drawn to lung abscess and lesions of the heart valves as possible sequelae of suppuration in the foot. It might be that bacterial necrosis of the liver might occasionally be related to foul-of-the-foot.

Mr. J. B. White thanked Dr. Arthur for presenting the paper. He agreed that it was well over time for some really good papers involving the cow's foot. He asked for the meaning of the first paragraph of Dr. Arthur's paper. Where one was definitely dealing with a case of foul-of-the-foot, and could inject the animal, one could go away reasonably confident that the cow would not require any further attention from one, and comparatively little from the farm attendants.

He had been interested in the various methods of restraining advocated by the different speakers. This must purely be a matter of personal choice, although he would agree that it was better to lift the leg with a rope above the hock and a direct upward pull than to put it lower down the foot and pull the leg backwards at all. He personally found that a very large number of feet could be examined without any rope at all, both fore and hind. If the tail was held well up, in the majority of cases one could make a perfectly sound examination of the foot.

Dr. Arthur, in reply, said that the thing was to make a thorough examination of a foot condition before resorting to the use of sulphonamides. He wanted to get that home forcibly. Many cases were treated in that way when a better examination of the foot at the beginning would have told the person that that treatment was not likely to succeed, and would have saved the animal a considerable period of lameness.

In the paper, he had mentioned interesting work done by Forman in the early days of sulphonamide application to foul-of-the-foot. An attempt had been made to try to assess the value of what was a soluble sulphonamide used at that time and compare it with ordinary or old-fashioned methods of simple surgical treatment, providing drainage. They failed to demonstrate a real superiority over simple surgical methods. That remained firmly in his mind and one wondered whether the more modern sulphonamide was more specific than that one was. This was likely to produce much contention but it was quite fair to refer to Roberts's work of 1948.

Mr. H. F. Hebeler was also interested in the same paragraph with regard to foul-of-the-foot, and Dr. Arthur's reply to Mr. White had interested him still further. Could Dr. Arthur enlarge on the "simple surgical methods" to be used in the treatment of foul-of-the-foot—the methods compared with the injection of the sulphonamide drugs? It would be true to say that, in practice in this country in these days, it was probably more common to get the case of foul-of-the-foot at the stage of early infection and before necrosis developed and, by the early use of the sulphonamide drug, necrosis was totally prevented. If necrosis had developed, surely then the simple medical treatment in the form of poulticing and pressure applications, following removal of the necrotic material, was all that was required? He was in the dark as to what the simple surgical means were.

Dr. Arthur, in reply, said that what was meant was the practice of débridement; the removal of debilitated tissue, the opening up of the lesion to air and the provision of drainage followed by the application of a protective dressing and bandaging.

Dr. R. N. Smith (Bristol) showed two illustrations of the sites of nerve blocks of the hind limb used by Professor Schreiber of Vienna. He then asked Dr. Arthur why he

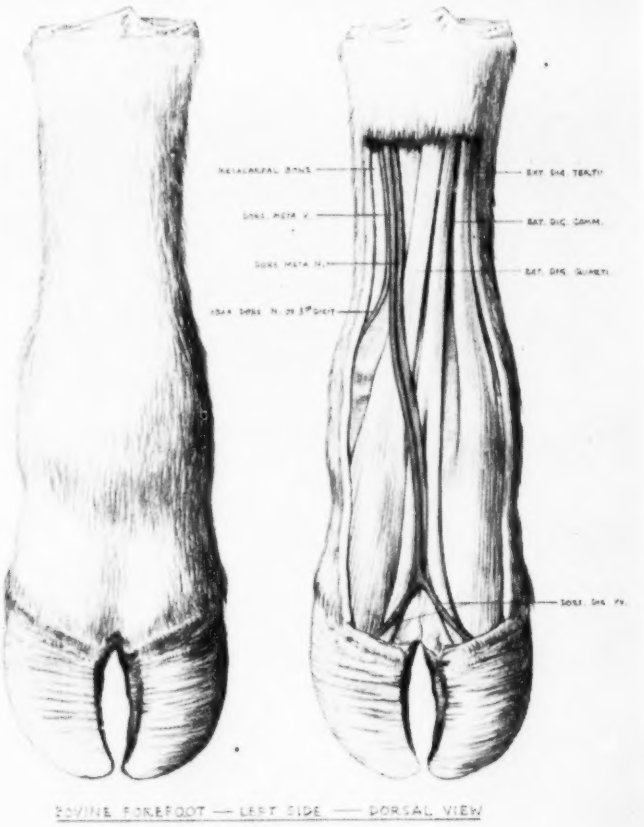


PLATE I

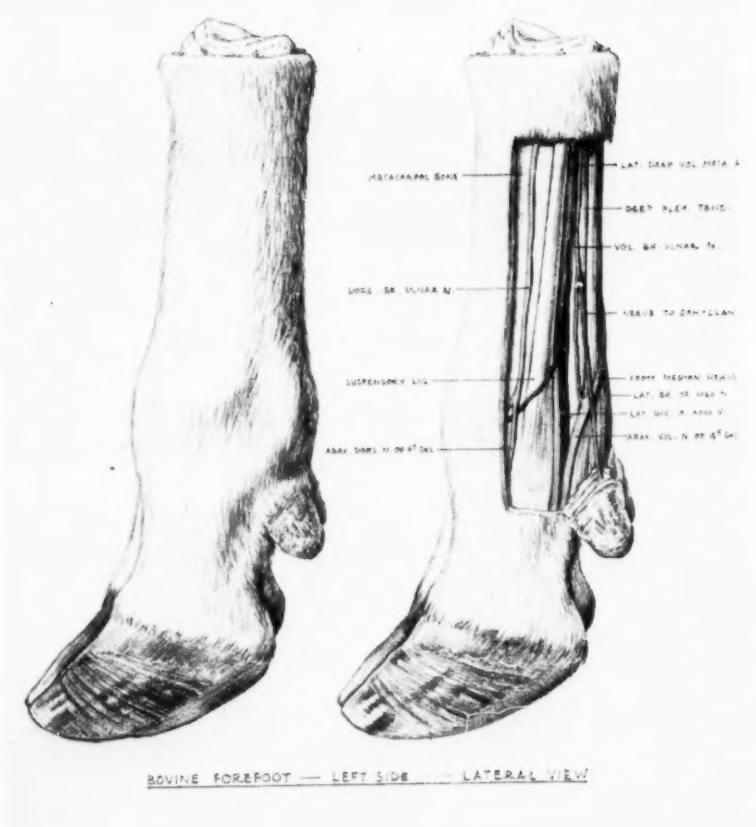
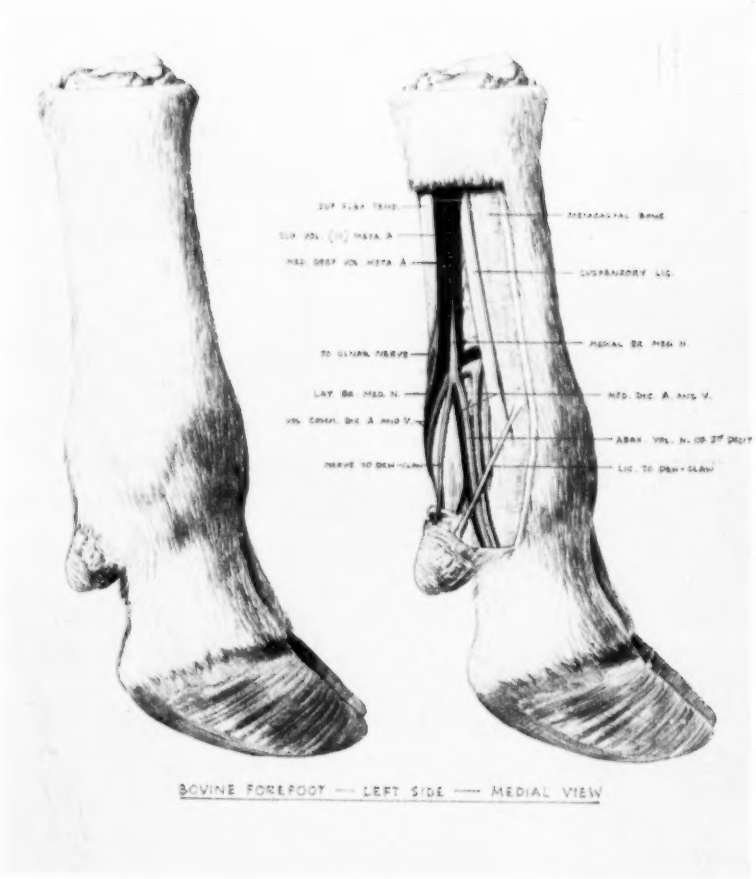
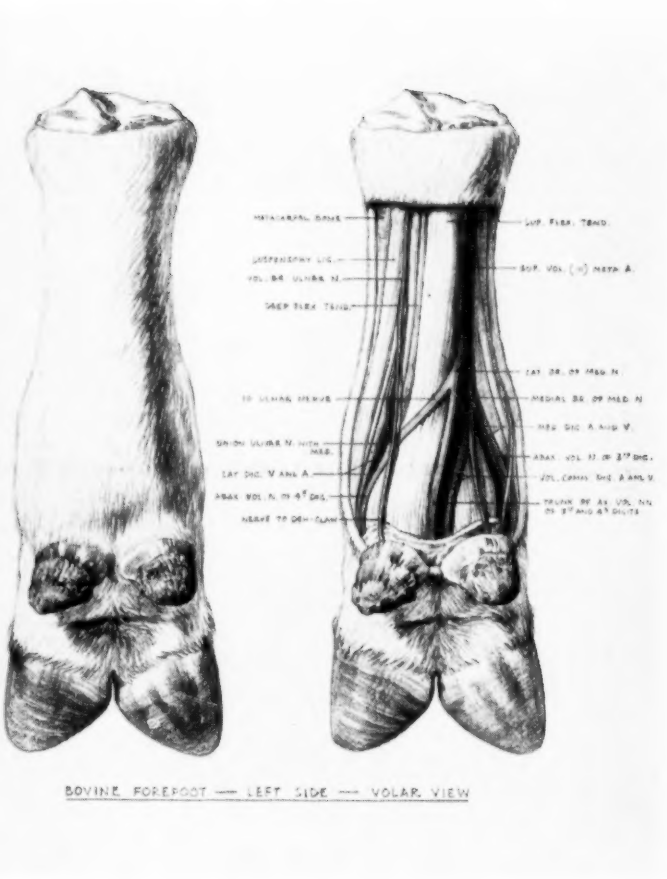

METACARPAL BONES
LAT. DEEP VOL. META. A.
DEEP PLEX. TENDO
VOL. BR. ULNAR. N.
DORS. BR. ULNAR N.
NERVE TO CRANIAL
SUSPENSORY LIG.
ABAX. DORS. N. OF 4TH DIG.
BOVINE FOREFOOT — LEFT SIDE — LATERAL VIEW

PLATE II



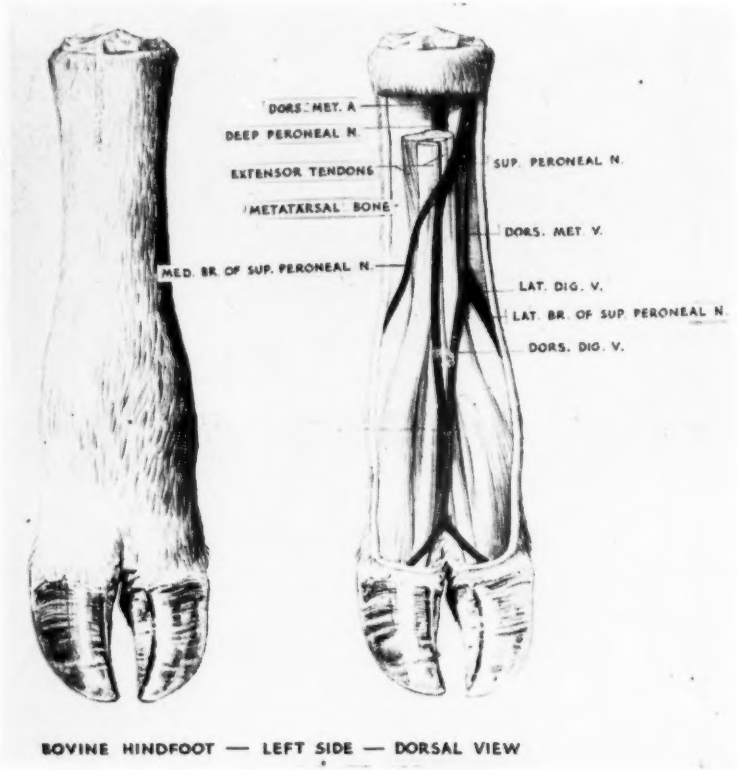
BOVINE FOREFOOT — LEFT SIDE — MEDIAL VIEW

PLATE III



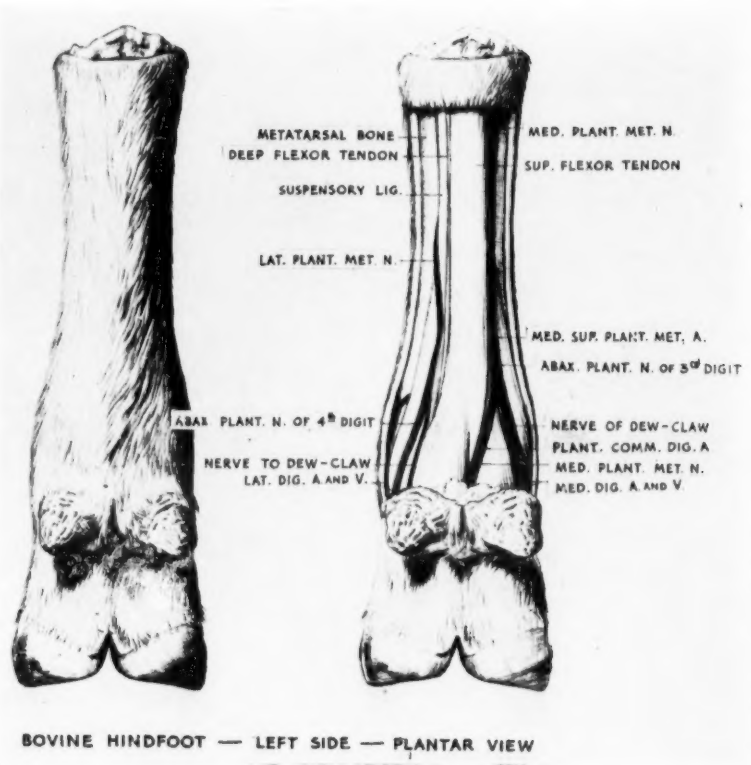
BOVINE FOREFOOT — LEFT SIDE — VOLAR VIEW

PLATE IV



BOVINE HINDFOOT — LEFT SIDE — DORSAL VIEW

PLATE V



BOVINE HINDFOOT — LEFT SIDE — PLANTAR VIEW

PLATE VI

PLATE VII.—The arterial arrangement of the bovine foot.

took two steps in digital amputation, first of the terminal phalanx and then sawing the second phalanx.

In reply to **Mr. H. F. Hebeler,** who asked what depth the injection was, Dr. Smith replied that for the tibial nerve it was beside the Achilles tendon and just underneath the skin. The structures under the skin could quite easily be felt if the Achilles tendon was rolled between the fingers. The depth for the fibular nerve in the lateral aspect was not much more. There was no choice, because if it was made too deep, there would be bone.

Dr. Arthur, in reply to Dr. Smith, said that the external popliteal was readily palpable; it was not subcutaneous and could be rolled in the fingers and injected without difficulty. In the early trial injections it was the posterior tibial which defeated him although he knew exactly where it was and it could be felt. The difficulty seemed to be to get the anaesthetic solution in the right plane of connective tissue. He had tried for the best part of half an hour to get it in the right place, but the external popliteal presented no difficulty.

With regard to the query about the two stages, what he had tried to indicate was that amputation of the digit was an operation which should be approached seriously. One could not make a satisfactory job of it by amputating the digit in a standing animal with an embryotomy wire.

Mr. M. Lustig (Israel) asked Dr. Arthur if he had ever used penicillin in the treatment of foul-of-the-foot.

Dr. Arthur replied that he had. It could be expected to give good results. It did if it was used sufficiently early but if there was secondary infection, which there very soon could be, the result would be poor.

Dr. R. N. Smith, returning to his point on amputation. quoted from the paper: "The knife is carried right down to the bone; the skin flap is then heavily retracted upwards and the subcutaneous tissue is cut through until the suffragino-coronal joint can be seen. This joint is disarticulated and the claw removed. The extremity of the os suffraginis is now exposed and removed by sawing with embryotomy wire which has been placed deep to the bone stump."

Was there any advantage in removing first of all the terminal phalanx and then going further up and taking off a further 1½ inches of bone?

Dr. Arthur replied that, by isolating or identifying the suffragino-coronal articulation in the first instance, one could tell exactly where one was in relation to the length of the digit. Many people satisfied themselves with the disarticulation and left it at that. There was probably greater pain in the healing process with the exposure of an articular surface, so bearings were obtained with disarticulating the joint, then isolating the distal extremity of the os suffraginis and placing the embryotomy wire deep to that and sawing it off. It was a matter of ease of technique, to some extent.

Mr. F. J. McCallum (Glasgow) asked whether, when Mr. Taylor said the nerves were subcutaneous or fairly superficial, he meant that they were so at the points usually used for blocking them?

Mr. Taylor replied that that was correct up to a point. Some people approach the deep peroneal nerve in the upper part of the metatarsus by going through the tendons. That was one method. Mr. McCallum was perfectly right: the nerve is deep at the above site but more superficial just below the fetlock.

The Chairman then called upon Mr. Colin Wood to present his paper. Mr. Wood had shown himself to be a very competent clinician in his particular line of country.

Mr. Colin Wood, presenting his paper "Diseases of the Bovine Foot," first thanked the Organising Committee for the privilege of being asked to do so. The paper was a simple one and was purely a record of the conditions met in practice in his particular area in South-West Scotland. He had made no attempt to go into any conditions that occurred abroad or even into conditions that might occur in other districts. He would be interested to hear of any conditions not mentioned which might be quite common in other districts.

He was surprised to see the amount of interest taken in nerve block anaesthesia of both the fore and the hind feet. In practice, he had attempted nerve block with results which were such as to make up his mind quite clearly that, when there was a general anaesthetic available, it should be used. In practice, amputation was approached in a very simple way. The animal was put down with chloral hydrate intravenously and intubated to keep the airway clear. A tourniquet was applied to control the haemorrhage and he used a scalpel for the incision between the clits, and an embryotomy wire for the removal of the clit. There was no trimming up of the wound. Penicillin cream was applied, and then cotton wool and bandaging. He put on wet boiled cotton wool that had been wrung out dry first as blood did not go through this so readily. After that, the bandage was left on for a week, then taken off and replaced by another one, the cotton wool being dry this time. This was left on for another 8 or 9 days. That was all the treatment they received. The treatment was economical and the results were good.

Mr. H. F. Hebeler said he had been extremely interested to read Mr. Wood's paper and very happy indeed that the latter had consented to write a paper on the practitioners' view point of diseases of the bovine foot. The importance of foot disease, as most practitioners would agree, was increasing every year, hand-in-hand with production. It seemed to him that as production, in dairy cattle particularly, was improved, so the occurrence of foot conditions increased and, apart from a brief mention from Dr. Arthur in his opening, little reference had been made to the genetic background. He believed that that genetic background to milking cattle was of the utmost importance. Poor conformation of the legs led inevitably to disease of the foot, and it would be interesting to hear Mr. Wood's views and the views of those connected with the A.I. service. With regard to that matter, his own opinion was that faulty conformation was mainly inherited from the dam, and it was extremely interesting to see, in certain herds and certain families of one particular breed the very high incidence of foot conditions. The overgrown plantar cushion and inturned wall were the natural corollary of a digit which was not bearing properly on the ground, and was the cause of many under-run feet.

He agreed that thorough stripping of the sole was important, but disagreed on the value of any form of astringent dressing. His view was that the best results were obtained by treating the matrix, be it exuberant or not, by firm pressure and bandaging. If under-run horn had been removed, there should be little necessity to do anything else. Drainage had been acquired and occurred while the stripping was going on.

He was surprised that, in Mr. Wood's remarks on acute laminitis in cattle, a condition well recognised in the South-West of England, one of the symptoms had not been mentioned. Perhaps it did not occur in South-West Scotland, but it was hyperpnoea. They were frequently called to see the animals because they were breathing rapidly and the farmer thought they had respiratory disease; in fact the hyperpnoea was due to acute pain in the foot.

He would be interested to hear Mr. Wood's view on the necessity of housing foul-of-the-foot cases following treatment, particularly if there had been rupture of the skin and some necrosis, not only from the point of view of treatment of the individual animal but from the point of view of preventing further outbreaks in the group of animals in which the infected one was situated.

Mr. Wood, in reply, said that a lot of conditions seemed to show an increase in incidence apart from foot troubles; this he thought was due to an increase in the recognition of such conditions. For example, 12 years ago, displacement of the abomasum did not occur; it now appeared to be a relatively common condition. So far as he had seen in the last 10 years, foot conditions had caused a lot of trouble, but farmers were only now beginning to realise that bad feet meant a loss in profits. There might be an increase in incidence due to modern methods of management.

With regard to the genetic factor, he heard a lot of people talk about bulls leaving heifers prone to foot trouble. In practice there was a lot of evidence that this might be the case, but as with a lot of things in practice, it was difficult to reach conclusions. If the genetic factor did come into

play, A.I. would be an ideal way, no doubt, of increasing the practitioner's work.

With regard to stripping the sole, that should not be the primary treatment of suppurative laminitis. The primary treatment of suppurative laminitis was to relieve pus pressure and allow moderate drainage. To strip the sole immediately only ensured that the animal was going to be lame for a long time until it got another firm horn on its sole.

He could not agree with the bandaging of the cow's foot. Why establish drainage and then block it? He used to bandage but had given it up as a waste of time. He bandaged following amputation and also when his knife slipped and he had a haemorrhage case on his hands.

With regard to astringent dressing, he used butter of antimony. That might be a personal preference. Other people used other drugs and got equally good results. He liked astringent treatment in cases where there was so-called "proud" flesh and found results quite reasonable.

He apologised for his omission with regard to acute laminitis. Mr. Hebeler was right and he agreed with him.

With regard to housing foul-of-the-foot cases, as a routine he did not often leave instructions that the animals should be housed or separated from the main herd. That might be a matter of local preference. He found that the Ayrshire cow, if taken away from the herd in the morning, was there in the afternoon and had probably crossed a couple of barbed wire fences in doing so. It had been found to be just as well to let them run with the herd. If he thought for one minute that the incidence in the herd would be reduced by housing the animal, he would house. He was not satisfied that foul-of-the-foot passed from one animal to another.

Mr. L. R. Stirling quoted from Mr. Wood's paper—"The systemic use of antibiotics is rarely indicated and their local application gives disappointing results." Why not use antibiotics? In his practice, he got an increasing number of foul cases in the early stages. Clients were definitely recognising the condition very early and the large numbers that were seen 5 or 10 years ago were not now seen. In those cases, spectacular results were obtained with ordinary crystalline penicillin. One injection, in the majority of cases, effected a cure. With regard to local application, a large number of young animals were seen, suffering from a condition which seemed to simulate the old cracked heel of the horse. At least one dressing of Chloromycetin Tincture cleared it rapidly. These treatments were very much more indicated nowadays than other local dressings of the older type, or even sulpha drugs, in his opinion.

The Opener

Mr. P. Greenough said that, during the past 60 years, there had been nearly 60 references in the literature to matters relating to the bovine foot. Most of the early work concerned the draught ox or was influenced by current horse practice of the period. About 50 per cent. of all the literature dealt wholly or partly with foul-of-the-foot. It was unfortunate that, until to-day, only about 7 British workers had contributed papers on foot problems, and it was therefore found that the 3 papers presented that morning comprised one third of the literature from sources in this country. The papers went a long way to filling a serious gap in the knowledge of the bovine foot.

Most practitioners found foot anaesthesia a problem to which he did not consider epidural anaesthesia was the answer. Dr. Arthur favoured that technique but he himself considered that any method requiring special preparations or prolonged supervision and involved unnecessary risks must have a limited application in practice. He believed that regional anaesthesia correctly applied was absolutely reliable but he pointed out that the technique described by Dr. Arthur did not, as was asserted, apply to the forelimb because the dorsal metacarpal nerve divided before it reached the fetlock. But this again was not a constant feature.

With regard to foul-of-the-foot, there had been difference of opinion with regard to treatment of the disease by sulphonamides. Dr. Arthur quoted Roberts as producing evidence decrying the use of sulphonamides. Roberts did not deny that sulphapyridine was 100 per cent. successful in treating the disease. Admittedly he suggested that untreated the disease was self-limiting but he also pointed out that, in 1 out of every 5 cases when treatment was withheld, there was a risk of serious complications developing. He admitted, furthermore, that natural recovery took time and that involved the animal in pain and loss of milk. Mr. Stirling and others had suggested the use of penicillin. He personally used penicillin exclusively and got extremely good results. He thought that it was partly due to the use of penicillin that the incidence of corono-pedal arthritis had dropped.

Dr. Arthur had described a condition called "blind fouls." This was a form of foul-of-the-foot in which no superficial lesion might be seen. The disease had been observed by Forman, Gibbons, McAuliff and Roberts. So far as he was aware, this was a well-recognised if uncommon condition and he wondered why Dr. Arthur had so definitely associated the condition with suppurative laminitis due to the practitioner failing to find a suppurating wound in the sole.

In describing his technique of digital amputation, Dr. Arthur had stated that he carried out the amputation through the os suffraginis. Mr. Greenough wondered if Mr. Taylor could tell them if the stability of the foot was likely to be upset by interfering with the cruciate ligament, the annular ligaments and the interosseus ligament of the first phalanx.

Slide. In the film presented by the speakers at the Congress this was the method used to lift the hind limb, and it closely resembled the one described by Mr. Wood. Like Mr. Wood, Mr. Greenough found the fore limb very much more difficult to deal with. He wondered if, as he finds it so much easier, Dr. Arthur could explain how he sets about a prolonged examination of the fore limb.

Slide. Here was a typical foul-of-the-foot lesion and the speaker agreed that these cases should be treated as open wounds and bandaged. He had been particularly successful when he had dressed the wound with Vaseline and penicillin tulle. He did not agree that bandaging need interfere with drainage as Mr. Wood had suggested because, with a little ingenuity, this problem could be overcome.

Slide. This again showed foul-of-the-foot, but in this instance the lesion was at the anterior commissure of the cleft which is a point at which the joint is very close to the coronet. It had been his experience that lesions at this site were the forerunners of a corono-pedal arthritis and he took particular care with them.

Slide. Sandcracks had been mentioned as another cause of corono-pedal arthritis. A very uncommon site for fissuring to take place was between the claws. Lesions of this type could easily be overlooked because they were very frequently obscured by filth. When these lesions occurred they were very dangerous and difficult to treat.

Slide. This showed a condition not mentioned by the other speakers. It was described by Fowler and Kingrey as chronic necrotic pododermatitis. Apparently *Fusiformis necrophorus* was found abundantly in the horn of the sole and it was presumably shed in large numbers into the soil. This would suggest that the natural reservoir for *Fusiformis* infection was in the horn and not in the soil. On the other hand, Dr. Arthur had stated that obviously *Fusiformis* was a soil saprophyte and he wondered if he could substantiate this view.

Slide. Most practitioners would be familiar with one or other form of this disease although they might not use the rather lengthy term, chronic necrotic pododermatitis. Mr. Greenough believed that the condition was more important than the profession realised and that many horn penetrations were caused by this disease and not by foreign bodies. The axial border of the sole was a common site for infection.

Slide. When the disease was extensive the function of the heel must be disturbed and strain must be thrown on to other regions. The white line, for example, could be split as in the case shown. When spaces occurred between wall and white line infection could rise up and penetrate the navicular bursa from the abaxial side of the foot.

Slide. The two stages of wall separation were shown here. In one part the space between the sole and the wall had been filled with blood, whilst in another (presumably at a

later stage) bacterial degeneration appeared to have occurred.

Slide. Here the os pedisos corona and navicular bone were shown. Between the deep flexor tendon and navicular bone is the important navicular bursa. The posterior aspect of the tendon merges with the cruciste ligament as it winds around the heel and this ligament merges into the digital cushion. Therefore, the navicular bursa is well protected from ventral attack but vulnerable from the sides. When the bursa is infected disease cannot spread directly to the joint because the interosseous ligament is interposed; however, it may rupture into the spaces above the cushion and form an abcess. This is the usual course of heel infection and one that may be relieved by bold surgery. If neglected, the tendon sheath, which comes only as far as the suchion, may be infected, or the naviculo-coronal ligament may be breeched to involve the joint.

Mr. Greenough believed that the majority of heel diseases could be resolved. Dr. Arthur had told the meeting that a sinus leading to bone was an indication that amputation should be performed. He was afraid that he did not follow this argument because it would seem that all sinuses must by devious routes pass the navicular bone, and he would certainly not agree that all claws with sinuses should be amputated.

Slide. The next slide was an example of posterior heel infection found in an amputated digit which had been split. Often in these cases the deep flexor tendon became necrosed allowing the extensors to lift the toe. He felt that this was a very characteristic feature of this complication and considered that Dr. Arthur was in error to associate it with corono-pedal arthritis.

Slide. It was possible to infiltrate the navicular bursa with a radio-opaque liquid. It was to be hoped that by developing this technique it would be possible to assess the stage at which navicular buritis was passed and when more serious complications were developing.

Slide. This slide showed that infection of the heel could be resolved even if the bone was involved. A small spikule of bone was recovered from the heel of a cow which subsequently made a perfect recovery.

Slide. This slide showed horn faults which had arisen after an acute febrile illness. Mr. Wood had told the meeting that the lameness was caused as the fault grew out—an observation with which Mr. Greenough agreed. Dr. Arthur, on the other hand, held the view that it was not associated with lameness.

Slide. Five types of deformity were recognised by German workers such as Fischer and Schieter. The disease was referred to as "corkscrew claw," and the condition occurred quite commonly in this country. Dr. Arthur stated that non-infective arthroses do not occur in cattle. Mr. Greenough would have thought that the periarticular exostoses encountered in this condition would have been classified as an arthrosis, and he wondered if Dr. Arthur would clarify the point.

Slide. The last slide illustrated the condition that Mr. Wood he thought described as chronic laminitis. This deformity occurred very commonly, and Mr. Greenough thought that even its much less severe forms was associated with disease. He believed that the profession should begin to think more about the importance of the conformation of the hoof. It was his opinion that the standard of hoof conformation was deteriorating and also that the incidence of foot disease was increasing; he felt that there might well be a link between these two facts.

The General Discussion

Dr. Arthur, in reply, commented that Mr. Greenough did not like anterior epidural anaesthesia but did not say why. He himself had seen one dislocation of the hip out of 20 cases. He would have liked figures to go on. Had Mr. Greenough had some unfortunate experiences and what was the percentage of them?

With regard to the contentious subject of sulphonamide preparations for treatment in foul-of-the-foot cases, he had not suggested anywhere in the paper that they should not be used. He had attempted to draw people's attention to the surgical pathology of the foot. If he could stimulate people to have another look at the foot or to examine it thoroughly before giving one of those injections, he would have achieved his purpose.

With regard to blind foul, he based his opinion that it was a suppurating laminitis on his experience.

On the question of amputation of the digit, he was not a person who rushed into amputation of a digit. He had tried to point out that there was a right time to amputate a digit. His main consideration as a surgeon was to relieve suffering; economic considerations came into it too, and any decision had to be tempered with that. He was somewhat irritated to feel, as a result of one or two of Mr. Greenough's remarks, that cases might have been left a little too long.

Fusiformis necrophoris as a soil saprophyte—he thouught these organisms were in the soil and multiplied in conditions of warmth and dampness.

He was not familiar with corkscrew claw but understood that it had been described in Holland.

It was obviously possible to have exostosis due to infection, but it was not necessarily the case.

Although he had had to take the offensive in replying to Mr. Greenough, he congratulated him most heartily on his interest in disease of the bovine foot. It was most salutary that a man so busy in practice could find the time to go into those conditions in such detail; it was a most time-consuming and onerous task. He admired Mr. Greenough's application and industry and thought that he deserved the highest praise. (*Applause.*)

Mr. K. O'Sullivan (Milk Marketing Board) said that he was somewhat perplexed by the differences of opinion between the essayists on the efficacy of the nerve block in the hind foot. The two speakers from the Universities were very much in favour, but the practitioner had not been so successful with it and had reverted to the use of a general anaesthetic. In dealing with bulls in an A.I. stud, he was particularly interested in the anaesthesia problem; with the provision of stocks it was unnecessary to cast the animal and, with the animal in a standing position in the stocks, facilities were better for exploration and intervention in dealing with foot problems.

Reference had been made to the possibility of some foot disorders being of an hereditary nature. Friesian breeders, in particular, often made reference to bad feet in their breed but so far had been unable to satisfy themselves of the actual condition or conditions involved.

The A.I. Service was aware of the possibility of foot troubles being transmitted through A.I. sires, and a system was available for collecting and collating information of that kind.

Mr. Wood stated that, if the A.I. Service was stepping up the frequency of foot troubles, it would be to the benefit of the practitioner, but Mr. O'Sullivan pointed out that it would have the very opposite effect on his colleagues in the A.I. Service. He stated that from his experience foul-of-the-foot was a rarity amongst A.I. bulls, but that interdigital growths were met with fairly frequently. In his experience, that condition appeared to be more prevalent in Hereford sires.

Mr. J. B. White (Salisbury) said that he did not think there was any question that the trouble was hereditary in the Friesian—particularly the two types of sandcrack which had been demonstrated, the medial sandcrack and the one that ran down the front. He believed that, in a practice not far from his own, there was a herd in which active steps had to be taken to breed it out because it had become such a problem.

With regard to *Fusiformis necrophorus,* this was governed tightly by soil moisture and temperature conditions. In autumn, a number of cases cropped up, but in November and early December, when the temperature dropped, the number dropped off. There were still lame cows, but foul-of-the-foot stopped. When the temperature rose again in the spring, the condition started again.

The cases were obviously very much governed by husbandry conditions. In his district, cows lay out all winter and, recently, folding kale was popular. On many grounds they were exposed to a large amount of flint which came up through the chalk, and lame cows were a tremendous

(*Concluded at foot of page* 1228)

The Concentration of Some Antibiotics in the Milk After Intramammary Infusion*

BY

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SUMMARY.—A brief account is given of antibiotics used for treating bovine mastitis. Persistence of antibiotics in milk was studied in lactating animals after intramammary infusion of penicillin, of streptomycin, of a combination of penicillin and streptomycin or of novobiocin in mineral oil plus aluminium monostearate base, at different concentrations. The concentration of penicillin in the dry udder infused during trials for prevention of dry cow mastitis has also been recorded. The results indicate that the rate of excretion of the different antibiotics varied, which may have a bearing on intramammary formulations in current use.

THE introduction of antibiotics, of penicillin in particular, has been considered the greatest advance yet made in the treatment of bovine mastitis, and there is now an extensive literature reporting their use for treating mastitis caused by *Streptococcus agalactiae*; see, for example, Kakavas (1944), Murnane (1945), Porter *et al.* (1946), Schalm & Casselberry (1946), Stults & Folley (1948), Stableforth (1948, 1949), Hughes *et al.* (1950), Wilson (1952), Edwards (1954), Wilson (1954), Davidson (1956) and Wilson (1959).

* Paper presented at the Annual Conference of the Association of Veterinary Teachers and Research Workers at Bristol, 1960.

The persistence of this antibiotic in milk, after intramammary infusion of doses ranging from 20,000 I.U. to 300,000 I.U. in different vehicles and suspending agents, has been studied by Watts (1948), Zweig (1949), Hignett (1950), Hughes *et al.* (1950), Edwards and Haskins (1953), Uvarov and Muggleton (1954).

Many trials on the use of penicillin for treating field cases of mastitis have also been reported; see, for example, Stableforth (1948), Hughes (1950), Hignett (1950), Wilson (1952), Wilson (1954).

The wide use of penicillin has reduced the incidence of mastitis due to *Str. agalactiae*, but in the last few years the number of cases associated with other organisms has increased. Particularly is this so with *Staphylococcus aureus* (Davidson, 1956). Moreover, an increasing number of strains of this organism have been shown to be resistant to penicillin; in consequence other therapeutic agents are being tried, such as streptomycin and the broad-spectrum antibiotics. Reports show, however, that penicillin is still the commonest agent used in routine treatment, either by itself or in combination with streptomycin.

The information about other antibiotics for the control of this disease is not as extensive as that about penicillin. Further, in the last few years there has been a tendency, particularly in the U.S.A., to

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Symposium on Diseases of the Bovine Foot.—*Concluded.*

problem—so much so that the question of whether to keep cows in or not was an impossibility if one had 10 to 15 on one's hands at once.

With regard to treatment, if there was a medial crack coming down the inside, it was a mistake to open that crack enough to get the underlying sensitive tissue bulging out; the cow would be terribly lame for some weeks. If the crack was opened to allow drainage, and cutting away done underneath, without allowing a piece of tissue to bulge and become proud, the cow would become much better. For a crack along the outside quarter at the heel, it was better to take an elliptical piece clean out instead of carving a hole out underneath. Cutting a piece elliptically out of the side meant that there was no hole to gather muck, and the cow could be turned out and would get better. With the crack down the front, a piece should be taken out of the bottom and a piece off the sole to take away the pressure from the bottom of the crack, just as was done with the sandcrack in the horse.

Mr. A. Steele-Bodger (Lichfield) referred to subacute laminitis in the Midlands and said that he believed that in Friesians and Ayrshires, subacute laminitis was almost concurrent with good milk production. The long-toed foot was found particularly in the Friesian and Ayrshire breeds, and basically started off as subacute laminitis. To-day, the manure passed by the dairy cow was liquid and sloppy; before the war, it was more like bullock's dung. The cows stood with their hind feet in liquid manure for 18 hours a day. Was it surprising that degenerative diseases took place? He was convinced in his own mind, in his own district at least, that that was a root cause of a large number of cases of poor hind foot growth. He agreed that hereditary factors did occur, particularly in the Friesian. It was pathetic to see young Friesian bulls, before they were 9 months old, with feet so curled in that they almost looked like horse shoes.

Mr. Wood's paper was an excellent contribution, and he heartily agreed with the comments on paring. People were far too afraid to pare deep enough.

In his part of the world the incidence of pure foul-of-the-foot had greatly reduced. His practice was to use one of the sulpha drugs or streptomycin.

Epidemics in young animals were becoming extremely common, and it seemed that epidemics occurred both inside and outside the buildings. It might be a question of drinking places. Why did it not affect adult animals to the same extent?

Poulticing was useful in cases of Irish or blind foul. It was extremely common in Irish cattle.

The Chairman said that there was no doubt, by the amount of interest taken in the subject, that great importance was attached to it by everyone. Quite a lot of problems of lameness in the cow were still to be solved.

He proposed a hearty vote of thanks to the speakers and to Mr. Greenough.

increase the amount of antibiotic in intramammary formulations, to use combinations of different antibiotics and to add adjuncts to therapy, such as sulphonamides and steroids (Vigue, 1955; Folley, 1957; Monti, 1958); proteolytic enzymes have also been included at times.

The potential danger of antibiotics occurring in milk has already stimulated the interest of public health authorities, and the need to restrict their use may have to be considered.

The results reported here are a part of a study in which the persistence of antibiotics was investigated during field trials of different preparations used for the treatment of mastitis when other agents had failed to control the infection. Some trials were arranged to compare the efficacy or otherwise of increased dosages of some antibiotics. Only the antibiotic levels are discussed here.

Material and Methods

Animals. In most groups 6 cows with different milk yields were included. Quarter milk samples were taken, with aseptic precautions, at normal milking. Cell count and Whiteside test were carried out before infusion of the various substances. Subsequent samples of fore-milk were taken over the period indicated. Results of antibiotic assays are recorded as averages for all four quarters of 6 animals.

Antibiotic assays. All antibiotics used were suspended in 3 g. of mineral oil containing 3 per cent. aluminium stearate gel; they were:—

(1) Procaine penicillin 300,000 I.U.;
(2) dihydrostreptomycin sulphate 0.25 gramme;
(3) dihydrostreptomycin sulphate 0.5 gramme;
(4) procaine penicillin 100,000 I.U. + 0.1 gramme dihydrostreptomycin;
(5) procaine penicillin 100,000 I.U. + 0.25 gramme dihydrostreptomycin;
(6) novobiocin (monosodium salt) 250,000 I.U.

Antibiotic assays. These we carried out by either the tube or plate method, but both methods were sometimes used.

Penicillin

Previous workers have indicated that 100,000 units of procaine penicillin in oily vehicles infused into each quarter generally gave an adequate therapeutic concentration, although the time of retention of this dose varied with different salts or suspending agents. Most have agreed that in lactating animals detectable amounts of penicillin from this dosage were present in the milk for up to approximately 48 hours. Thus Zweig (1949) found that in experimental cows, treated with procaine penicillin in arachis oil and aluminium stearate, antibiotic was found in the milk for 72 hours.

Results

Procaine Penicillin, 300,000 *I.U.*

It may sometimes be advisable to maintain bactericidal concentrations in the udder for longer periods than 48 hours, *e.g.* with *Str. dysgalactiae* infection, in dry udders for prevention of mastitis or when the veterinary surgeon requires to treat animals himself. Use of the preparation containing 300,000 units of penicillin was therefore also investigated.

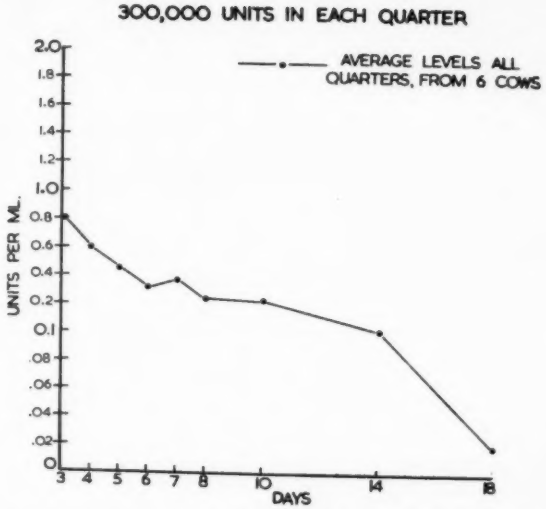

FIG. 1.—Penicillin levels in the milk of cows after intramammary administration of procaine penicillin veterinary cerate. 300,000 units in each quarter.

Fig. 1 shows that levels of over 0.1 I.U. per ml. were found in the milk for 8 days, and milk from all cows showed detectable levels of penicillin for at least 14 days after treatment. Uvarov and Muggleton (1954) reported that the magnitude of these levels during the first 7 days varied inversely with the milk yields of the individual cows.

Procaine Penicillin, 300,000 *in the dry udder*

Previous work has indicated that pencillin infused into dry udders at different intervals before parturition could reduce the occurrence of the disease (Pearson, 1951, Report on Animal Health Service, 1953).

In our trials cows were infused at turning out, sampled 3 weeks later and re-infused. This method was used over several seasons. During the last two summers secretion from cows were examined 3 weeks after infusion and again at calving time (see Figs. 2 and 3).

Retention of penicillin showed considerable variations and appeared to be greatest in cows that had been dry longest; for example, a cow that had been dry for 7 months before infusion had 100 units penicillin per ml. milk 20 days after infusion. In one group the average penicillin level from 10 cows that had been dry for 2 to 4 months was 5.4 units, but only 0.6 unit per ml. was detected in some animals that were dry for one month before infusion. All the figures recorded are averages of four individual quarters. The values for penicillin retention at calving were even more scattered.

Dihydrostreptomycin

Dihydrostreptomycin, 0.25 *gramme*

Edwards and Haskins (1953) have indicated that streptomycin is not retained after 1½ to 2 days in the fore-milk even in cows giving low milk yield (Fig. 4). Since increasing the dose of penicillin from

FIG. 2

PENICILLIN RETENTION IN THE DRY COW AFTER INFUSION OF PROCAINE PENICILLIN

Procaine penicillin — 300,000 units

1958

Herd	Cow No.	Dry period (days)	Concentration I.U. per ml. 21 days (average 4 qtrs.)
A	1	20	0·81
	2	23	0·63
	3	23	0·05
	4	23	1·60
	5	23	0·12
	6	23	0·10
	7	30	0·14
	8	43	0·66
	9	44	0·69
	10	65	6·00 (2 qtrs.)
B	1	29	nil
	2	36	40·00
	3	43	0·12
	4	50	1·30
	5	64	2·40
	6	106	2·60
	7	197	*> 100·00 (3 qtrs.)

Number of animals	Group	Dried off	Sampled	Average penicillin concentration I.U. per ml. 21 days
1	1	January		*> 100·00
1	2	April	All	2·60
2	3	May	cows	4·20
7	4	June	sampled	6·12
6	5	July	28.7.58	0·55

FIG. 4

STREPTOMYCIN CONCENTRATION IN THE FORE-MILK AFTER INJECTING 250 MG. DIHYDROSTREPTOMYCIN SULPHATE INTO EACH QUARTER OF FIVE COWS

Cow	Yield (l.)	Quarter	Concentration of streptomycin (μg. per ml.) 24 hours	48 hours	72 hours
1	41	L.F.	40·9	0	0
		L.H.	163·8	1·28	0
		R.F.	10·24	0	0
		R.H.	10·24	0	0
2	31	L.F.	10·24	5·12	0
		L.H.	0·64	0·32	0
		R.F.	20·48	0·32	0
		R.H.	1·28	0	0
3	29	L.F.	80	10	0
		L.H.	20	2·5	0
		R.F.	40	5	0
		R.H.	20	2·5	0
4	15	L.F.	81·9	1·28	0
		L.H.	81·9	1·28	0
		R.F.	10·24	0·32	0
		R.H.	5·12	0·64	0
5	10	L.F.	160	10	0
		L.H.	80	0·6	0
		R.F.	80	>0·3	0
		R.H.	80	>0·3	0

FIG. 3

PENICILLIN RETENTION IN THE DRY COW AFTER INFUSION OF PROCAINE PENICILLIN

Procaine penicillin—300,000 units

1959

Herd	Cow No.	Dry period (days)	Concentration I.U. per ml. 21 days (average 4 qtrs.)		Interval to calving (days)	Concentration I.U. per ml. post-calving (average 4 qtrs.)
A	1	6	0·40		126	nil
	2	30	0·05		118	,,
	3	44	0·12		82	,,
	4	52	0·63		100	,,
	5	69	1·35		13	0·04
	6	72	0·93		90	nil
	7	101	1·30		18	0·01
	8	133	—		—	0·04
	9	150	0·13		30	nil
B	1	24	0·11	Re-infusion	—	—
	2	37	0·24		123	nil
	3	72	0·43		—	—
	4	77	0·05		134	nil
	5	84	4·76		61	0·05
	6	93	0·64		73	nil
	7	105	0·03		114	,,
	8	111	0·43		36	,,
	9	122	0·19		39	,,
	10	133	0·18		109	,,

No. of animals	Group	Dried off	Sampled	Average penicillin concentration I.U. per ml. 21 days
1	1	March		0·13
4	2	April	All	0·21
4	3	May	cows	1·68
5	4	June	sampled	0·68
4	5	July	18.8.59	0·13
1	6	August		0·40

100,000 to 300,000 units prolongs its presence in the udder, it was decided to investigate doses of 0.5 gramme dihydrostreptomycin, which had already been used in some formulations in U.S.A.

Dihydrostreptomycin, 0.5 gramme

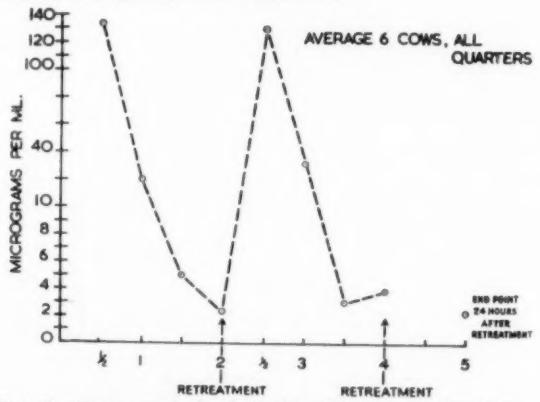

FIG. 5.—Streptomycin levels in the milk of cows after intramammary infusion of 0.5 gramme dihydrostreptomycin cerate.

From this increased dose there is a higher initial concentration, but no persistence, and the antibiotic is completely excreted by the second day after infusion.

Penicillin with Streptomycin

This combination of antibiotics was studied at 2 different dose levels of streptomycin.

Procaine Penicillin, 100,000 *I.U.* + *Dihydrostreptomycin*, 0.1 *gramme**

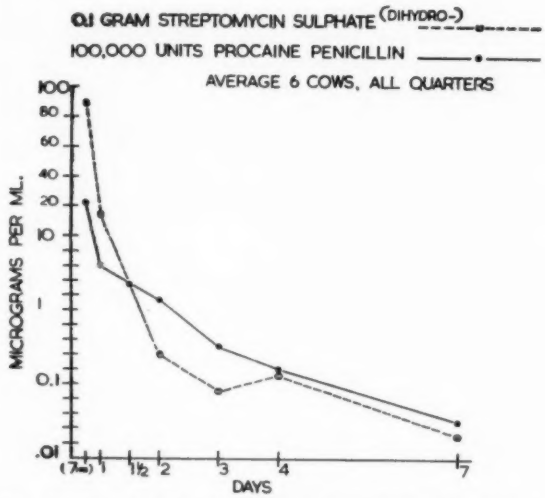

FIG. 6.—Antibiotic levels in the milk of cows after intramammary infusion of streptopen veterinary cerate*.

Penicillin was excreted gradually for 2 to 3 days after treatment: streptomycin levels were low after the first day after infusion.

Procaine Penicillin, 100,000 *I.U.* + *Dihydrostreptomycin*, 0.25 *gramme*

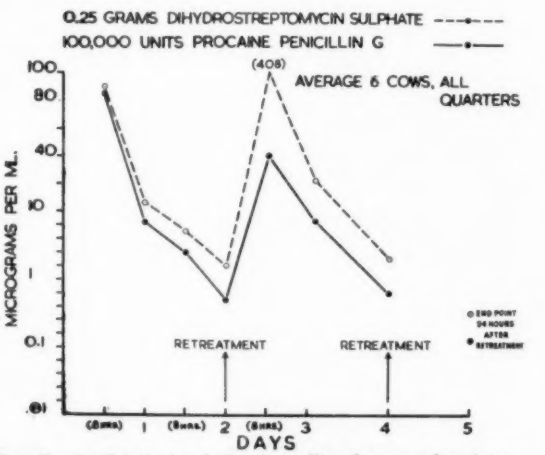

FIG. 7.—Antibiotic levels in the milk of cows after intramammary infusion of streptopen veterinary cerate.

* Streptopen Veterinary Cerate, Glaxo.

There was equally rapid excretion of streptomycin, despite the increased dose.

Novobiocin

Novobiocin, 250,000 *Units*

This showed excretion of the antibiotic similar to that of streptomycin. Effective levels were only present for 24 hours (Fig. 8.)

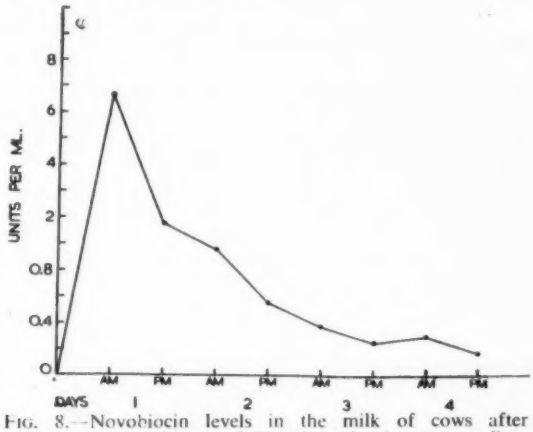

FIG. 8.—Novobiocin levels in the milk of cows after intramammary infusion of 250,000 units (as monosodium salt).

Discussion

This work was undertaken not only to evaluate the different preparations that might be of use in the treatment of mastitis, but also to try to verify the suggestion that larger doses of antibiotics produce clinically better results. With penicillin it appears that increasing the concentration also increased the period of retention, but this did not apply to streptomycin; a dose of 0.25 gramme or 0.5 gramme of streptomycin was excreted as rapidly as a dose of 0.1 gramme.

The excretion of penicillin from the "dry" udder was subject to wide variation, depending presumably on the amount of internal secretion occurring in the non-lactating udder. Great differences in antibiotic concentration were noted not only among different cows, but even among the different quarters of the same animal.

The results indicate that, because of the different behaviour of antibiotics in the udder, further studies are necessary before bigger doses or more frequent use of these substances can be recommended. Such studies will have to be extended to field cases of disease, so that *in vitro* and *in vivo* results can be compared to give more fundamental information on these antibacterial agents.

Acknowledgments.—I thank Dr. S. J. Edwards for providing me with secretions from dry cows infused with 300,000 I.U. penicillin and for permission to use his table on streptomycin excretion from one of his trials; my colleagues for carrying out antibiotic assays, and also Mr. R. M. Loosmore and Mrs. D. Howell for recommending suitable herds for this work and for their collaboration in those trials.

(*Concluded at foot of page* 1232)

Vaccination of Game with Lapinised Rinderpest Virus

BY

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AND

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SUMMARY.—Seventy-two head of wild game belonging to 12 species were vaccinated with lapinised rinderpest virus. The over-all case mortality rate was 19.4 per cent. The species with the least innate resistance proved to be Grant's gazelle (Gazella granti Brooke), *bush-pig* (Potamochoerus porcus L.) *and warthog* (Phacochoerus aethiopicus Pallas). *Deaths also occurred amongst vaccinated reticulated giraffe* (Giraffa reticulata de Winton), *waterbuck* (Kobus ellipsiprymnus Ogilby) *and white-bearded wildebeest* (Connochaetes taurinus Burchell).

INFORMATION on the response of African wild game to attenuated rinderpest virus is meagre. Daubney (1943) observed clinical reactions in buffalo, bushbuck, duiker, giraffe and oryx vaccinated with caprinised rinderpest virus. In 1944 he recorded that one reedbuck had died after vaccination with caprinised virus. On the other hand only mild reactions were observed in vaccinated warthogs. Wilde (1950) successfully infected dik-dik and Thomson's gazelle with discharges collected from cattle reacting to caprinised rinderpest virus. Buffaloes vaccinated at Muguga with lapinised rinderpest virus responded with a transient fever only (R. D. Brown, unpublished). Wild buffaloes in the Queen Elizabeth National Park in Uganda have been vaccinated without untoward sequelae after prior immobilisation with either D. tubercurarine chloride or succinylcholine chloride (Harthoorn & Lock, 1960).

Recently rinderpest infiltrated into one of the larger ranching areas of Kenya. Among the properties threatened was that of a game trapper who requested vaccination of his recently-captured game. He accepted the unknown risk involved and it was decided to use lapinised rinderpest virus if a preliminary trial proved successful.

Materials and Methods

Preliminary trial. A field dose (1,200 rabbit ID_{50}) of lapinised rinderpest virus was inoculated into a buffalo, a reticulate giraffe, an oryx and a warthog. The animals were examined one week later. The buffalo had a mild pyrexia but was otherwise clinically normal. The others were considered normal.

Vaccination. The remaining artiodactyla on the premises were then vaccinated with lapinised rinderpest virus. There were 68 head belonging to 12 species, namely buffalo (*Syncerus caffer* Sparrman), eland (*Taurotragus oryx* Pallas), Grant's gazelle (*Gazella granti* Brooke), Thomson's gazelle (*Gazella thomsonii* Günther), impala (*Aepyceros melampus* Lichtenstein), Masai giraffe (*Giraffa camelopardalis* L.), reticulated giraffe (*Giraffa reticulata* de Winton), oryx (*Oryx beisa* Rüppell), common waterbuck (*Kobus ellipsiprymnus* Ogilby), whitebearded wildebeest (*Connochaetes taurinus* Burchell), bush-pig (*Potamochoerus porcus* L.) and warthog (*Phacochoerus aethiopicus* Pallas).

Post-vaccinal examinations. The isolated situation of the ranch precluded frequent visits. Simple clinical responses such as a staring coat, inappetence and diarrhoea were noted by the owner. The animals were examined by us on the 7th, 11th and 23rd days after vaccination.

Autopsies. Unfortunately only 5 of the animals which died after vaccination were available for autopsy. Lymph nodes from 3 were collected and

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The Concentration of Some Antibiotics in the Milk after Intramammary Infusion.—*Concluded.*

The help of some practising veterinary surgeons was also invaluable.

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TABLE I
RESPONSE OF EAST AFRICAN GAME TO LAPINISED RINDERPEST VIRUS

Species	No. vaccinated	Clinical signs			Deaths
		Staring coat	Inappetence	Diarhoea	
Buffalo	6	4	4	4	0
Eland	5	1	1	0	0
Grant's gazelle ...	5	5	5	5	5
Thomson's gazelle	6	0	0	0	0
Impala	6	6	6	2	0
Masai giraffe ...	2	0	0	0	0
Reticulate giraffe	22	4	4	4	4
Oryx	4	0	0	0	0
Common Waterbuck ...	3	1	1	1	1
Wildebeest ...	10	5	5	5	1
Bush-pig	2	2	2	2	2
Warthog	1	0	0	0	1
Total ...	72	28	28	23	14

tested for the presence of rinderpest diffusible precipitinogen (White, 1958).

Results

Post-vaccinal response. A total of 72 animals, including those in the preliminary trial, were vaccinated. Twenty-eight (38.8 per cent.) exhibited clinical signs and 14 (19.4 per cent.) died (Table I). The most severely affected species was Grant's gazelle. The 2 bush-pigs died unexpectedly after very brief illnesses on the 7th and 8th day after vaccination. The warthog likewise died unexpectedly on the 15th day after vaccination. It was examined by us on the previous day and was considered to be in good health. Unfortunately a *post-mortem* examination was not possible. Four of the 22 reticulate giraffes, 1 of the 3 waterbuck and 1 of the 10 wildebeest died. Four of the 6 buffaloes had mild transient reactions. One of the 5 eland reacted. All 6 impala reacted but none died. The 6 Thomson's gazelles, the 4 oryx and the 2 Masai giraffes did not react.

Autopsies. Two bush-pigs, 2 Grant's gazelles and 1 wildebeest were subjected to autopsy. Mouth lesions were absent. The bush-pigs and the wildebeest exhibited lesions consistent with acute rinderpest. The lesions in the Grant's gazelles were minor.

Mesenteric lymph nodes from the Grant's and the wildebeest were tested for rinderpest diffusible precipitinogen. The former were both positive. The latter was negative.

Discussion

For many years differences in the innate resistances of cattle to rinderpest have been recognised. The classic example is the difference in the response of the Hill and Plains zebu cattle of India (Stockman, 1903). Attenuated virus vaccines have revealed more subtle differences. In East Africa lapinised rinderpest virus elicited a minimal clinical response in vaccinated East African Shorthorned Zebus and their crosses with various breeds of European origin but in the indigenous Sanga cattle of Ankole it induced a marked reaction (Brotherston, 1951). The same strain of virus killed Japanese Black cattle (Fukusho, Ishii & Furuya, 1953).

Similar differences in the innate resistances of African wild game can be inferred from the published reports of natural rinderpest in game. Probably all members of the Order Artiodactyla are susceptible. Nevertheless the only species regularly incriminated in outbreaks are buffalo, eland, wildebeest and wild pigs. Our findings have extended these earlier impressions and suggest that many East African game possess a lower innate resistance to rinderpest than the majority of cattle.

Rinderpest rapidly burns itself out in animals with a low innate resistance. Outbreaks therefore in species such as buffalo and eland, while spectacular, are relatively unimportant in the maintenance of the disease. The dangerous species are those possessing a high innate resistance because they perpetuate the infection unrecognised. In our series the Thomson's gazelles, the oryx and the Masai giraffes remained clinically normal after vaccination. Two explanations are possible. They may have been immune through natural exposure to rinderpest or they may have possessed a high innate resistance. Unfortunately time did not permit the collection of serum samples before vaccination and consequently the point cannot be resolved. Nevertheless in recent years the incidence of natural rinderpest in Kenya has been low (Libeau & Scott, 1960) and we would suggest that the apparent unresponsiveness of these species merits further investigations in regard to their possible rôle in the epizootiology of rinderpest.

Acknowledgments.—Mr. Carr Hartley's interest and co-operation are gratefully acknowledged. This paper is published by permission of the Director of Veterinary Services, Kenya and the Director of the East African Veterinary Research Organisation.

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FOOT-AND-MOUTH DISEASE

Foot-and-mouth disease was confirmed among cattle on Friday, December 16th, at West Dean, Gloucestershire.

Restrictions on the movement and marketing of livestock in the Infected Areas around Greenock, Renfrewshire and around Tranent, East Lothian were withdrawn as from December 17th.

The three outbreaks in the Area around Greenock involved the slaughter of 330 cattle, 1,071 sheep and 183 pigs; the one outbreak in the Area around Tranent involved the slaughter of 232 cattle and 400 sheep.

News and Comment

PUBLICITY AND THE SLAUGHTER POLICY

A number of correspondents have written to the B.V.A. drawing attention to criticism of the slaughter policy for foot-and-mouth disease made in the Press. Every time such criticisms are seen in the newspapers the General Secretary of the B.V.A., in his capacity of public relations officer, sends out a letter similar to that quoted below, which was published in the *Aberdeen Press & Journal*, on December 15th.

Sir,—The recent outbreaks of foot-and-mouth disease have highlighted once again the Government's slaughter policy, and some criticism has appeared in the Press regarding it. Some contributors have even suggested that vaccination should be adopted to immunise the national herd.

On this point it should be stressed that foot-and-mouth disease is caused by a virus, and several strains are known to exist. Vaccination against one type of the virus does not protect the animal from infection by the other types.

The duration of an immunity following vaccination is of a limited period. It would be necessary to carry out vaccination with all the known types that infect animals in this country, and this at frequent intervals, in order to provide a reasonably immune herd.

No vaccine can guarantee 100 per cent. immunity, and there is always the danger that a sub-clinical form of the disease might be set up and cause dissemination of infection.

The slaughter policy depends on having a completely susceptible animal population in which the clinical signs are clearly recognisable.

The Gowers Committee, who reported on the Government policy in this country in 1954, estimated that the cost of such vaccination would be in the region of £30,000,000 annually, whereas the cost of compensation at the time of the worst epidemic in this country in recent times (1951-52) amounted to only £2,500,000. Since then the cost has averaged £500,000 per year.

In dealing with animal diseases one consideration must be the cost to the country, but that does not necessarily mean that due regard is not being paid to extensive research throughout the world. We in Britain have the most up-to-date centre for foot-and-mouth disease research (Pirbright), and this centre is a universal reference library for typing the strains of virus which appear throughout the world.

The institute has also been responsible for the production of various types of vaccine employed in every country where the disease is endemic.

Whilst vaccination has been responsible for the reduction of the disease in many parts of the world, including the Continent of Europe, it has not eradicated the disease.

However, it is the hope of all countries to reduce the incidence to such small figures that the slaughter policy would be a practicable method of dealing with it.

NEW ERADICATION SCHEMES

As we go to press it is learned that the Minister of Agriculture, in a written Parliamentary reply made last Tuesday, stated that the Government had decided in principle to introduce a compulsory slaughter policy with compensation against swine fever. In addition, free vaccination against contagious abortion would be made available. The Minister added that a further announcement would be made after these matters had been discussed with interested organisations.

We shall publish full details as quickly as information becomes available.

PROFESSOR DR. KARL ERIKSSON

The former rector of the Veterinary College in Stockholm, Professor Dr. Karl Eriksson died on September 28th, 1960. He was born on September 10th, 1892, and completed his veterinary training in Stockholm in 1916. He took his doctor's degree in 1943 and was rector of the College from 1948 to 1956 during which period there was a thorough re-equipping of the College for both research and teaching. He was President of the Swedish Veterinary Association from 1938 to 1947. Karl Eriksson's greatest scientific work was to do with the genetics of disease, and his clarifying work on the route of inheritance of hypoplasia of the gonads in the Swedish Highland breed of cattle made possible effective measures to prevent the destruction of this breed.

MELBOURNE UNIVERSITY VETERINARY SCHOOL

Several years ago a committee of veterinarians and graziers investigated means of re-opening the Melbourne University Veterinary School which closed in 1929. The Council of the University supported the proposal and it was finally decided to launch a public appeal for funds.

The Graziers' Association of Victoria was most active in organising the appeal throughout Victoria, and one of their prominent members, Sir Rupert Clarke, acted as chairman of the appeal committee.

It is intended that £100,000 be provided towards the cost of new buildings, and that the remainder be the nucleus of the endowment fund. The total of the public appeal promised to date is £187,000.

The Premier of Victoria recently announced that the Government intended to re-establish the Melbourne Veterinary School, and he anticipated an early start on the project. He hoped that the first Professor would soon be appointed to assist in planning the project.

THE COLONIAL SERVICE

Mr. Macleod, the Colonial Secretary, has announced that the Government are studying a plan to set up a new department with its own Minister to organise technical aid for developing territories.

If the idea proved to be practicable the Government would act immediately.

The new Minister would be responsible to the Colonial Office, the Commonwealth Relations Office, and the Foreign Office.

He would direct technical and advisory assistance to the colonies, to Commonwealth countries, and to underdeveloped foreign countries.

Readers may recall that, under the above heading, we published a full report on the Government White Paper (Cmmd. 1193) dealing with future employment of professional personnel in emergent colonial territories. In order further to discuss such employment as it may affect members of the veterinary profession a delegation from the B.V.A., comprising the President, Dr. S. E. Piercy (chairman of the Overseas Committee) and the General Secretary, waited on Sir Hilton Poynton, the Permanent Under-Secretary of State for the Colonies. At the meeting Sir Hilton was accompanied by three of his officials, including Mr. R. S. Marshall, Adviser on Animal Health to the Colonial Office and a cordial discussion ensued.

MR. L. ST. BEL GOLLEDGE

Our readers will have read with much regret the brief note we published last week on the death of Mr. L. St. Bel Golledge, at the early age of 66. Mr. Golledge was born in Sherborne, where he practised all his life, having followed his father, the late Major C. H. Golledge. He was educated at Dean Close, Cheltenham, and at the Royal Veterinary College, whence he graduated in 1919. He specialised mainly in large-animal practice, and was a noted authority on the horse, his opinion being highly valued in hunting and racing circles all over the South-west of England. He was veterinary surgeon to the Wincanton and Taunton race-courses and honorary veterinary surgeon to the Yeovil Agricultural Society.

He had a long connexion with the British Veterinary Association having served on its Council for a number of years. He was also a Councillor of the Society of Practising Veterinary Surgeons, and a past President of the Mid-west Veterinary Association. He is survived by his wife and a married daughter to whom our deep sympathy is expressed.

His partners, Mr. R. A. Brown, Mr. G. L. Barker, and Mr. H. L. Trump write:—

By the death of Lionel St. Bel Golledge the profession has lost one of its greatest sons, and we a firm and wise counsellor.

Beneath a sometimes rather brusque exterior and caustic sense of humour beat a heart of gold, as all who knew him well will realise.

Graduating at the end of the horse age, Mr. Golledge, with his usual foresight, made himself thoroughly efficient in all branches of general practice. In his latter years he had largely left the "hurly-burly" of general practice to his partners, and returned to his first love—the horse. His opinion in this sphere was sought over a very large area of the South-west.

We have always felt proud to be associated with him, and count ourselves privileged to have the onerous task of carrying on in his stead.

Our heartfelt sympathy goes out to his widow and only daughter at this sad time.

UNIVERSITY NEWS

Cambridge

In the recently held examinations the results were as follows:—

First Part, Veterinary Examination

The following passed the full examination:—

Mr. A. V. Edwards, Fitzwilliam House; Mr. D. I. B. Hoare, Queens'; Mr. J. M. King, St. John's; Mr. J. M. Owen, Magdalene; and Mr. C. K. Peace, Pembroke.

Mr. B. N. J. Parker, Trinity, passed in two out of three sections of the examination.

Second Part, Veterinary Examination

The following passed the full examination:—

Mr. C. J. Randall, Queens'; Mr. J. M. J. Best, Trinity Hall; and Mr. F. G. Davies, St. Catharine's, passed the sections of the examination which they had not completed previously. These three candidates subsequently took their degrees of Bachelor of Veterinary Medicine and were later admitted as members of the Royal College of Veterinary Surgeons.

Glasgow

The following students have passed in the Final B.V.M.S. examination. They will graduate on January 14th, 1961: Adshead, Philip; Akpata, Richard I.; Barclay, Donald F.; Calder, Kenneth H.; Cowie, Alexander C.; Dalgleish, Margarita O.; Rickerby, Nancy; Veitch, Ernest R.; and Williams, Gwilym R.

Liverpool

Degree of B.V.Sc.

SECOND EXAMINATION: PART I

Akpokodje, J. N.; Baskerville, A.; Batchelor, A. L.; Bendefy, A. A.; Bramley, P. S.; Brinkler, J. L.; Counter, D. E.; Dennison, Margaret; Edington, N.; Flood, P. F.; Furnevall, Elizabeth A.; Howard, Nina S. K.; Hughes, P. H.; Ishmael, J.; Jones, T. W.; McNaughton, J. R.; Markusfeld, O.; Milroy, J. P.; Molony, V.; Na'isa, B. K.; Pinckheard, Ann; Thompson, J. D.; Townsend, C. J. A.; Udall, N. D.; and Wosu, L. O.

SECOND EXAMINATION: PART II

Akpokodje, J. N.; Baskerville, A.; Batchelor, A. L.; Bendefy, A. A.; Brinkler, J. L.; Cope, B. T.; Curran, M. H.; Dennison, Margaret; Edington, N.; Flood, P. F.; Harper, F. D. W.; Howard, Nina S. K.; Ishmael, J.; Jones, T. W.; McNaughton, J. R.; Markusfeld, O.; Molony, V.; Pinkheard, Ann; Thompson, J. D.; and Udall, N. D.

THE REGISTER OF VETERINARY SURGEONS

The undermentioned gentlemen were admitted to membership of the Royal College on the dates indicated:—

Best, Julian Martin John, B.A., VET.M.B.(CANTAB.), 1 Kendra Hall Road, South Croydon, Surrey, December 10th, 1960. Davies, Frederick Glyn, B.A., VET.M.B.(CANTAB.), 96 Monkmoor Road, Shrewsbury, Salop., December 10th, 1960. Randall, Christopher John, M.A.(CANTAB.), VET.M.B.(CANTAB.), Marley

Hill, Marley Lane, Haslemere, December 10th, 1960. Collins, Timothy Dominick, Brooklawn, Merrion Avenue, Blackrock, Co. Dublin, December 13th, 1960, Dublin. Hand, Patrick Joseph, The Berries, Kiltoom, Co. Roscommon, Eire, Dublin, December 13th, 1960. McIver, Stuart Holland, "Maisiemore," Hillsborough, Co. Down, Northern Ireland, December 13th, 1960, Dublin.

Registrations in the Commonwealth List :—

Manolson, Frank, D.V.M.(ONTARIO), c/o Toronto-Dominion Bank, 3 King William Street, London, E.C.4, December 1st, 1960. Wells, Ronald James Herbert, B.V.SC.(SYDNEY), 1 Madingley Road, Cambridge, December 5th, 1960.

PERSONAL

Colonel George Barnett, O.B.E., M.C., has had his tenure as Colonel Commandant of the R.A.V.C. extended until July, 1962.

R.C.V.S OBITUARY

CALLOW, Charles Noris, G.M.V.C., Dorian, Albury, N.S.W., Australia. Graduated July 6th, 1920, at the Royal Veterinary College, London. Major, late A.A.V.C. Died May 21st, 1960.

HYLAND, Francis Joseph, R. N. Hospital, Ventnor, Isle of Wight. Graduated December 13th, 1924, at Dublin. Died December 12th, 1960.

THE ASSOCIATION OF VETERINARY STUDENTS

The Annual Conference of the Association will be held in New Brighton, Wallasey, from January 20th to 22nd, 1961. The Liverpool University Veterinary Society will be acting as host. The programme will be as follows:—

Friday, January 20th.

10 a.m. Official opening in Wallasey Town Hall by Mr. G. N. Gould, senior Vice-President of the Royal College of Veterinary Surgeons.

11 a.m. Symposium and discussion—"The Veterinary Profession, Past, Present and Future." Speakers: Mr. J. W. Barber-Lomax, Mr. L. G. Anderson, Professor J. G. Wright.

2 p.m. Commercial visits, films and sports.

8 p.m. Dance in the Students' Union, Liverpool.

Saturday, January 21st.

Visit to the University of Liverpool Veterinary Field Station, Leahurst. Closed-circuit T.V. surgery demonstration. Tour of the new veterinary building.

Sunday, January 22nd.

11 a.m. A.G.M. in Wallasey Town Hall.

1.30 p.m. Visits to Chester Zoo and Great House Experimental Husbandry Farm, Rossendale.

COMING EVENTS

January

5th (Thurs.). CENTRAL VETERINARY SOCIETY. Meeting at the Royal Veterinary College, Camden Town, N.W.1., 6 p.m.

12th (Thurs.). B.S.A.V.A. SUSSEX REGION. Meeting at the New Imperial Hotel, First Avenue, Hove, 7.30 p.m.

20th, 21st and 22nd (Fri., Sat., and Sun.). Annual Conference of the Association of Veterinary Students in New Brighton, Wallasey.

February

7th (Tues.). 12th Anniversary Dinner-Dance of the University of Bristol Centaur Society at the Berkeley, Bristol.

9th (Thurs.). Annual Ball of the Royal (Dick) School of Veterinary Studies in the Assembly Rooms, George Street, Edinburgh, 9 p.m.

B.V.A. COMMITTEE & COUNCIL MEETINGS

Tuesday, January 17th, at 7, Mansfield Street

5 p.m. Finance Sub-committee.

Wednesday, January 18th, at 7, Mansfield Street

10.30 a.m. Farm Livestock Committee.
12 noon. Home Appointments Committee.
2.15 p.m. Small Animals Committee.
4 p.m. Parliamentary and Public Relations Committee.

Thursday, January 19th, at 7, Mansfield Street

10.30 a.m. Veterinary State Medicine Committee.
2.15 p.m. General Purposes and Finance Committee.

Friday, January 20th

10.15 a.m. Council Meeting, Connaught Rooms, Gt. Queen Street, London, W.C.2.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Dorset. Charlton, Shaftesbury (Dec. 14).
Glos. Ryefield Farm, Wormington (Dec. 14).
Yorks. Mill Avens Farm, Moorsholm, Saltburn-by-Sea (Dec. 13).

Foot-and-Mouth Disease

Aberdeen. Middleton of Rora, Newton of Rora, Longside; No. 1, 2 and 3, Holdings, Aquhorthies, Inverurie (Dec. 14).
Derbys. Wilson House Farm, Wilson, Melbourne; Wilson Hall Farm, Wilson, Melbourne (Dec. 13).
Essex. Beverley Farm, Bumbles Green, Nazeing, Waltham Abbey (Dec. 13).
Northumberland. Bythorne, North Wylam, Newcastle-upon-Tyne (Dec. 14).

Fowl Pest

Bucks. Lassie Cottage, Langley Park Road, Iver (Dec. 13).
Essex. Sheldon, Central Park Road, Laindon, Basildon; 101, Cross Road, Maldon (Dec. 13); 9, Park Drive, Wickford (Dec. 14); Tolleshunt Farm, Tolleshunt D'Arcy, Maldon (Dec. 15).
London. 15, Wellstead Avenue, Edmonton, N.9 (Dec. 15).
Norfolk. Uttings Farm, Poringland, Norwich; Church Farm, Elsing, Dereham; The Stores, Forncett St. Peter, Norwich; High Barn Farm, Somerton, Great Yarmouth; 5, Collis Lane, Somerton, Great Yarmouth; Orchard Farm, Lingwood, Norwich; Dairy Farm, Lingwood, Norwich; Church Farm, Redenhall, Diss; The Grange, Freethorpe, Norwich; Wood Farm, Carbrooke, Thetford; Lower Farm, Hempnall Norwich; Hill Farm, South Burlingham, Norwich (Dec. 13); Holme Close, Brundall, Norwich; Picton Farm, Tharston, Long Stratton, Norwich; Pine Grove, Hickling, Norwich; Weybread Lodge, Weybread, Diss; 2, Council Houses, Aslacton, New Buckenham, Norwich; 34 The Street, Ringland, Norwich; The Old Post Office, Weston Longville, Norwich; Vaunoo, Stoke Holy Cross, Norwich;

The Stores, Seething, Norwich; Fenland, Seething, Norwich; Kirstead Road, Seething, Brooke, Norwich; Manor Farm, Seething; Bethal Farm, Potter Heigham, Great Yarmouth; Peasland Farm, Peasland Green, Elsing, Dereham (Dec. 14); Manor Farm, East Somerton, Great Yarmouth; 123, Stevenson Road, Larkman Estate, Norwich; Park Farm, Old Buckenham, Attleborough; 2, Chedgrove Loddon, Norwich; The Fruit Farm, Seething, Norwich; Busy Bees, Poultry Farm, Rollesby, Great Yarmouth; Lodge Farm, Fressingfield, Diss; The Street, Long Stratton, Norwich; Ferry Farm, Reedham, Norwich; 14, Mitre Court, Appleyard Crescent, Norwich; The Boot Store, The Street, Long Stratton, Norwich (Dec. 15).

Suffolk. Hill Horse Farm, Ellingham, Bungay; The Arboretum, Great Barton, Bury St. Edmunds (Dec. 13); Bylam Farm, Chelmondeston, Ipswich (Dec. 14).

Yorks. Ashdale Road, Helmsley; 45, Bridge Street, Helmsley; 22, Ryegate, Helmsley; Bridge Street, Helmsley (Dec. 13); Canal Side, Milby, Boroughbridge (Dec. 14).

Swine Fever

Derbys. Vine Cottage, Barrow-on-Trent (Dec. 13).

Essex. Beechcroft Piggeries, Mill Street, Harlow (Dec. 13).

Mont. Cefntwich, New Mills, Newtown (Dec. 15).

Norfolk. Avenue Farm, Langley with Hardley, Norwich (Dec. 13).

Notts. Glendale, Chapel Lane, Fiskerton, Newark (Dec. 13).

Suffolk. Red Roof, Cookley, Halesworth (Dec. 14).

Warwicks. 146, Tile House Lane, Shirley, Solihull (Dec. 14).

Yorks. Hawthorne Cottage, Catterick, Richmond (Dec. 14); Layton Fields, Caldwell, Richmond (Dec. 15).

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Students' Clinical Societies

Sir,—May I, as one still at the "receiving end" of "Veterinary Education" draw to your correspondents' attention the valuable part played by the various student clinical societies that exist in our veterinary colleges?

At this School we have a very active Clinical Club, which holds weekly meetings during the winter and spring terms, and at which over the past 35 years, a vast number of topics has been dealt with by many distinguished speakers.

I feel that the great importance of these societies lies in the fact that, by way of the informality in which the meetings are conducted, students are able to enter into discussion with the speaker in a manner they would feel unable to do in the more formal type of university lecture. These discussions often prove to be of as great value as the papers themselves. Also, it is possible for the clinical society to include those topics in its programme which, although of interest and importance, are slightly outside the curriculum of the veterinary college, and would otherwise have to be overlooked. For example, practice organisation, economics, and research methods and projects. Yet a further function of the clinical society is to provide the senior student with the opportunity to present a paper himself, and to thus gain experience in the art of public speaking.

Finally, Sir, I feel it only right to say how much our clinical societies depend upon those members of the profession, practitioner and research worker alike, who give up so much of their valuable time to present papers to us, and to express to them on behalf of my fellow students, our very sincere thanks.

Yours faithfully,
PAUL CARWARDINE,
Secretary.

Clinical Club,
Royal (Dick) School of Veterinary Studies,
Edinburgh, 9.

December 12th, 1960.

Virus Pneumonia: Is it?

Sir,—I wonder how many colleagues have, like myself, spent an hour vaccinating pigs, and then 3 hours afterwards have found ourselves coughing, spitting and spluttering, with an uncomfortable tight feeling across the chest? I mentioned this recently to a client who keeps about 1,000 store pigs, and he said that he, too, had had the same experience. As he was in much more frequent contact with the pigs he was worse off than I; so much so, in fact, that

Reference to this photograph is made at the end of this letter.

he resolved to do something about it, and for a start changed from meal feeding to nut feeding.

Before the change he used to send 3 casualties a week, with "virus pneumonia," for emergency slaughter. Since the change he sends so few that he estimates there is less than one every 3 months.

While writing I thought you might be interested in the enclosed photograph showing 2 calves born to a Friesian cow earlier this year. One weighed 100 lb. and the other 85 lb., both born dead, were photographed an hour later. The young man in the picture is a 6-footer.

Yours faithfully,
W. J. TARVER.

39 Beech Grove,
Ashton-on-Ribble,
Preston,
Lancs.
December 13th, 1960.

Dictyocaulus arnfieldi Infestation in Horses

Sir,—Mr. R. B. Fletcher's letter in THE RECORD of December 10th prompts me to send in the following report.

In August, 1958, I was called to a small riding school to examine a 5-year-old, and 2 aged ponies all affected with coughing over a period of 3 to 6 weeks. The animals were on old low-lying pasture which had been used for horses for years. Nasal and ocular discharges had not been observed and appetite had not been affected. On examination temperatures were all normal and the cough was of the type commonly seen in mild cases of husk in cattle. In consequence, fresh faeces samples were sent to the Veterinary Investigation Centre, Reading, whose workers found *Dictyocaulus* sp. in the samples from the 2 older animals. All 3 ponies were treated with cyanacethydrazide in food with apparently satisfactory results.

Now that we have drugs available for the treatment of this condition our colleagues in equine practice may be able to give us more details, and also enlarge on Mr. Fletcher's reference to "broken wind."

Yours faithfully,
J. W. H. HOLMES.

81a, Wantage Road,
Wallingford,
Berks.
December 15th, 1960.

Treatment of Cat Influenza

Sir,—In connexion with Mr. Trim's letter of December 10th. I write to mention that I have over the last 2 years employed prednisolone therapy in cases of cat influenza (feline distemper), with encouraging results. However, it has become very apparent to me that this drug should not in any circumstances be used while a cat is showing any thermal reaction, since I believe it acts only to spread the virus. In those cases where there is anorexia for some time after the febrile stage has passed I have found on occasions quite spectacular results by administering the drug by injection, at 48-hourly intervals for a period of 6 days and then following this up for 5 days with 1 mg. tablets by mouth.

I have also used prednisolone in the hard pad-distemper complex diseases, again with similar results. I find it especially useful in the animal that has shown little or no febrile disease but has shown mild nervous symptoms; combined with vitamin B therapy, spectacular results have again resulted. In the more severe nervous involvement the results have not been very gratifying.

I should be interested to learn the views of any other members of the profession in this connexion.

Yours faithfully,
TREVOR TURNER.

15 Mandeville Road,
Northolt,
Greenford,
Middlesex.
December 13th, 1960.

Sir,—I should like to confirm Mr. P. N. Trim's findings with regard to prednisolone therapy in premonitis or cat 'flu. It is probably the experience of most of us that the virulence of this infection varies very considerably, but in the chronic, or relapse, or endemic cattery type of infection I have found prednisolone, particularly the longer acting trimethylacetate, a powerful reinforcement to penicillin or chloramphenicol therapy.

Yours faithfully,
JOHN F. BRADLEY.

90 Bournemouth Road,
Parkstone,
Poole,
Dorset.
December 12th, 1960.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN
Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
16th to 30th November, 1960 ...		10	—	91	127	—	63
Corresponding period in	1959	13	—	4	398	—	63
	1958	4	—	—	25	—	39
	1957	9	—	10	81	—	33
1st January to 30th November, 1960 ...		185	1	234	1,817	—	1,131
Corresponding period in	1959	237	2	13	1,377	—	1,196
	1958	143	5	116	667	—	1,146
	1957	299	8	135	897	—	885